a journal for

engineers

all users of

diamonds

and other

materials

INDUSTRIAL DIAMOND REVIEW

NATIONAL ENGINEERING LABORATORY
10 FEB 1960
LIBRARY

incorporating INDUSTRIAL DIAMOND ABSTRACTS

D.S.I.R. National Lending Library for Science and Technology

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

Vol. 20 No. 230

6 Books 1960-62 20 - 22 (230) - (265)
1960 20 (230) - (235) 4450

AUSTRALIA
BENELUX
BRAZIL
BRITISH GUIANA
CANADA
FRANCE
GREAT BRITAIN
INDIA
ITALY
JAPAN
NEW ZEALAND
SCANDINAVIA
SPAIN
SWITZERLAND

Triefus

INDUSTRIAL DIAMONDS

TRIEFUS & CO. LTD.,
THAVIES INN HOUSE, 4, HOLBORN CIRCUS,
LONDON, E.C.1, ENGLAND

DIAMOND PRODUCTS

TRIEFUS INDUSTRIES LTD.,
MANOR ROYAL, CRAWLEY, SUSSEX, ENGLAND

INDUSTRIAL DIAMOND COMPANY (SALES) LTD.

INDUSTRIAL

DIAMONDS

FOR ALL

APPLICATIONS

ENQUIRIES INVITED

88/90 · HATTON GARDEN · LONDON · E·C·1

Telephone: HOLBORN 2642/2247 *Telegrams:* IDECE, LONDON

Are you as satisfied with your Diamond Tools as you could be?

Whatever your application, from straightforward Dressing to precision Turning, there is an Indusmond Diamond Tool to cut your costs and increase efficiency. Backed by technical representatives in all parts of the country, this service is at your disposal without obligation. May we send you a copy of our catalogue illustrating some of the many Diamond Tools and Wheels we manufacture?

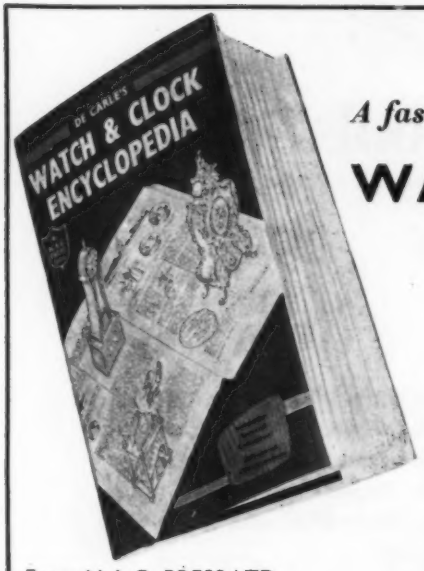
Indusmond

INDUSMOND - THE COMPLETE DIAMOND TOOL SERVICE

INDUSMOND (DIAMOND TOOLS) LTD ● 4, GREVILLE ST., LONDON E.C.1

Northern Office ● SUSSEX STREET, SHEFFIELD 4. Telephone SHEFFIELD 20701

Birmingham & Midlands ● Mr. G. H. CHURCHWARD, COOKHILL, Nr. ALCESTER, WORCS.



JUST PUBLISHED

A fascinating and invaluable book for everyone

WATCH AND CLOCK ENCYCLOPEDIA

By Donald de Carle, FBHI.

3000 entries. 1300 illustrations. Many special sections including the following :

Table of altitude
Antique clock and clock case terms
Balance spring alloys
Balance spring sizes
Conversion to heights from barometer readings
Bracket clock styles
Calendar in 15 languages
Chimes for clocks
Chronometer nomenclature
Greenwich Observatory tests for chronometers
Marbles for clock cases
Clock case woods
English clock case styles
Clock trains
NPL craftsmanship watch test
Dates in horology
English period styles
French furniture styles
French period clock styles
Gear trains for clocks and watches
British Hallmarks
Swiss marks on precious metals
Longcase clock styles
Mainspring gauge sizes
Marbles and ornamental stones
Metals used in horology for watches
Motion work trains
Mouldings
Standard time zones
Swiss catalogue system
Swiss Official Bureaux tests for watches
Testing standards for watches
Timers
Watch glass styles
Watch hand styles
Watch part nomenclature in six languages
Watch trains
Winding buttons
Wood for clock cases
Workshop hints and helps
Wrist watch case styles

From N.A.G. PRESS LTD.,
226 Latymer Court, London W.6
or your Bookseller.

Price 50/- by post 51/6

DIAMOND TECHNOLOGY

by Paul Grodzinski

800 pages: 500 illustrations: 94 tables.

CHAPTERS

Chapter 1—Technology of Machining Methods.
Chapter 2—Dividing Diamonds and Gem Stones.
Chapter 3—Bruting.
Chapter 4—General Survey of Grinding and Polishing.
Chapter 5—Grinding and Polishing Gem Stones.
Chapter 6—Grinding and Polishing Diamond.
Chapter 7—Drilling and Boring Holes.
Chapter 8—Carving and Engraving.
Chapter 9—Diamond Powder—Its Production and Use.
Chapter 10—Polishing Gem Stones for Jewellery.
Chapter 11—Manufacture of Watch and Instrument Jewels.
Chapter 12—Manufacture of Diamond and Sintered Carbide Dies.
Chapter 13—Industrial Diamonds, Selection and Orientation.
Chapter 14—Setting Diamonds in Tools.
Chapter 15—Grinding and Lapping Sintered Carbides.
Chapter 16—Production of Piezo-Electric and Optical Crystals. Bibliography. Appendix.

From your Booksellers or the Publishers. Price 52/6d, by post 55/-

N.A.G. PRESS, LTD., 226, LATYMER COURT, LONDON W.6.

$10 in U.S.A. and CANADA, distributed in U.S.A. and CANADA
by Huebner Publications Inc., 1975, Lee Road, Cleveland, Ohio.

Exporters

WOLVERHAMPTON
DIAMOND DIE
& TOOL CO. LTD.

ALL GRADES OF
BOARTS AND INDUSTRIAL DIAMONDS

11 HATTON GARDEN LONDON E.C.1

TELEPHONE HOLBORN 3017 CABLE PARDIMON LONDON

DIAMANT BOART

DIAMOND IMPREGNATED TOOLS
ARE USED ALL OVER THE WORLD

Wheels

Saws

Drill Bits

Truing and dressing tools ∴ Hones Boring Crowns
Dental Tools

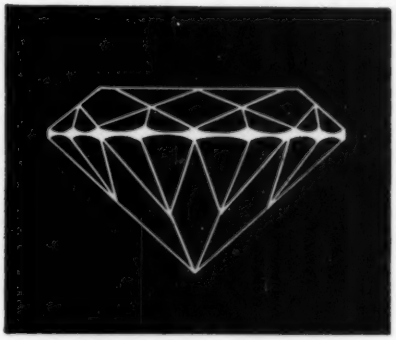
74, avenue du Pont de Luttre, Brussels, Belgium
Sole representative in U.K. : **Compentrad Ltd, 31, Throgmorton Street, London, E.C.2**

D. DRUKKER & ZN. N.V.

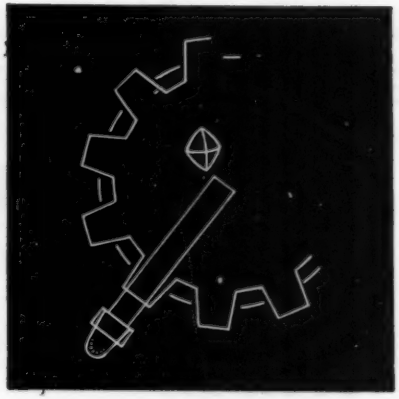
SPECIALISTS in

INDUSTRIAL DIAMONDS

cleaving and sorting



diamonds in art and industry



amsterdam, holland.

12 sarphatikade

phone : **67321** (3 lines)

cable : **DUBBELDEE.**

If you are interested in our products please visit our works

INDUSTRIAL DIAMOND REVIEW

Vol 20 No 230
JANUARY 1960

Editor-in-Chief :
Eric M. Bruton

Managing Editor :
Patrick Greene

★

© 1959 *N.A.G. Press Ltd.—All rights reserved.*

PRINCIPAL CONTENTS

Generally Speaking Adamant 5
Industrial Diamonds on Show 6
Some Growth Characteristics of Synthetic Diamonds S. Tolansky and I. Sunagawa 7
The Inspection and Maintenance of Diamond Wire-Drawing Dies 14

★

Industrial Diamond Review is published monthly at 1s 3d per copy, and is obtainable through newsagents and booksellers or by postal subscription (15s yearly, post free). Subscriptions in the United States of America are $2.50, and can be entered through the usual subscription agencies or direct through the publishers :—

N.A.G. Press Ltd
226 Latymer Court
London W.6.
(Telephone : RIVerside 2143).

★

Contributions of scientific, technical and practical interest, and news items, are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Material not accepted will be returned.

★

All editorial communications should be made to the Managing Editor at
2 Charterhouse Street
London E.C.1
(Telephone : FLEet Street 1577)

Printed by
Martin's Printing Works Ltd., Berwick-upon-Tweed, England

Generally Speaking

Up and Up

The sales of diamonds for the year 1959 set a new record, reaching a level of over £91,000,000, according to the figures published by the Central Selling Organization in London recently. Of this total, rather more than £28,000,000 was accounted for by industrial diamonds; this compares with a value of slightly over £16,000,000 for the previous year, and, in view of the increasing competition of synthetic material, is a remarkable figure. It can hardly be expected than an increase of 75% can be repeated each year, and, indeed, it would scarcely be possible to keep supply up with demand at such a pace. Nonetheless, it is symtomatic of the great increases in the uses of industrial diamonds that have taken place recently.

Over the Iron Curtain

It has been announced recently that the Central Selling Organization will be handling all the diamonds that the USSR wishes to dispose of outside the soviet group. It will be interesting to see what types of stone, and in what quantity, will be delivered for sale.

ADAMANT

It is regretted that, owing to a combination of circumstances beyond the control of the Editorial staff or the Printers of the Industrial Diamond Review, this issue has been delayed. We apologize to all our readers for the inconvenience that has been caused by this delay, and we trust that it will not be repeated.

Industrial Diamonds on Show

From Scientific Research to Heavy Industry

From the 17th of February to the 16th of March, the Birmingham City Museum and Art Gallery will be presenting an exhibition covering the industrial and scientific uses of diamonds at the Museum of Science and Industry in Newhall street. At the same time there will be a parallel show of gem diamonds in the Art Gallery.

The Science Museum exhibition is the first devoted to this subject ever to be held in the United Kingdom, and it has been well supported by the industrial diamond trade, the machine tool industry, and a number of other organizations. Working machine tools, fitted with diamond tooling, will give demonstrations of the accuracy and perfection of finish that can be obtained in this way, and measuring instruments, themselves equipped with diamond tracing styli, will check the parts produced.

In addition to a range of usual types of machine tools, one or two unusual pieces of equipment will be on show, including a refractometer using a diamond as the prism, a scratch resistance tester with a diamond point, and a radiation meter with a diamond as the sensitive detector. Another wholly new item, never before shown in this country will be an air-driven drill which rotates at a speed of 300,000 rev/min. This is a development, for engineering use, of a similar machine designed for dentists, and is no larger than a fountain pen. With the special diamond tools that have been designed for use in this drill, a number of difficult operations can be carried out that might otherwise prove impossible or exceedingly troublesome.

Many of the leading English manufacturers of diamond tools have co-operated with the Museum authorities in the organization of this exhibition by lending examples of their products, and assisting in the working machine tool section of the show. These firms, and the machine tool manufacturers, have also assisted by providing the originals of the photographs that will be used to expand and develop the information that will be given by the static and working exhibits, whilst overall technical assistance and advice has been provided by the Industrial Diamond Information Bureau.

A series of lectures will be given during the course of the exhibition, and it is hoped that it will be possible also to have film shows in the Museum Lecture Theatre. In this way, some of the applications of diamonds that cannot be shown in the exhibition because of the size of the equipment or for other reasons will not have to be entirely neglected.

This exhibition is an enterprise that should do much to increase knowledge of diamond tooling, both amongst engineers and laymen, and we hope that it will be as well attended as it deserves.

News Items

1) It is reported that the diamond fields of the Yakutalmaz Trust (the organization responsible for the development of the Yukutian diamond field) have increased their output by more than 2½ times in 1959 as compared with 1958. A further 30% increase is forecast for 1960.

2) Diamond production in British Guiana in November 1959 is reported to have totalled 62,392 stones, of an overall weight of 9,935 ct, a great increase over the October figures of 42,541 stones weighing 5,497 ct.

The production for the first eleven months of 1959 was 379,376 stones weighing 52,961 ct, compared with 225,921 stones weighing 26,691 ct in the same period of the previous year.

3) The exports of diamonds from Tanganyika during the first six months of 1959 amounted to 179,234 ct, valued at £1,381,790, as against 245,477 ct worth £2,195,403 in the corresponding period of 1958.

This decrease in output was not continued into the second half of the year, as the figures for the period July-October inclusive were 326,490 ct, valued at £2,594,520 as against 172,688 ct, worth £1,448,269 in the same period of 1958.

4) The first floating dredge to be used for the recovery of diamonds in the Soviet Union is said to be about to be brought into service at Mirny in Yakutia.

Surigao Consolidated Mining Co reported that recent development work on its copper property in Zamboanga del Sur, the Philippines, has uncovered numerous outcrops over an area covered by 200 claims. They are now being developed by diamond drilling and tunnels.

Company engineers said that diamond drills have encountered three high grade veins at the 200 to 300 ft level. Cores from the diamond drill holes indicate veins 3 to 10 ft wide, containing 6% copper.

On the south end of the property, one tunnel has followed the vein more than 200 ft and revealed an average of 6.73% copper over a width varying from 5 to 13 ft. Development work about 2½ miles to the north has shown 5 veins containing a commercial grade of ore. There are outcrops in the intervening area, said the report, indicating that the veins are continuous for a distance of over 2½ miles.

Some Growth Characteristics of Synthetic Diamonds: A Distinction Between Natural and Synthetic Diamond

by

S. Tolansky and I. Sunagawa*

This article by Professor Tolansky and Dr Sunagawa of Royal Holloway College, University of London, discusses some of the characteristic features that can be observed on the faces of natural and synthetic diamond crystals. The synthetic crystals dealt with are all of the GE type, as none of the De Beers production was available for testing at the time of these experiments.

Introduction

In this report a description is given of some new observations made on synthetic diamond surfaces with a high definition precision phase contrast microscope. The synthetic diamonds studied were those recently issued from the USA made by General Electric of Schenectady, NY. They were supplied to us in part by Professor Dame Kathleen Lonsdale of London and in part by Dr. J. Custers of Johannesburg. Altogether about one carat was available, but as the diamonds are all very small (few are longer than one tenth millimetre) there is a considerable number even in a single carat. The characteristic new structure features which we report here were shown by both groups. It is very unlikely that they were both made at the same time. The diamonds are grey, black and brown, with an unusual number of cubes present. It has been stated[1] that the synthetic diamonds formed at lower temperatures are predominently cubiod and dark and that progressively as the temperature is raised first dodecahedroids then octahedroids appear and also the colour clears towards a whiter appearance. Thus it is that one finds far more cubic crystals in a collection of synthetic diamonds than one would expect, relative to the usual mixtures of natural diamonds which appear from the mines.

The batch supplied by Professor Lonsdale belonged to a collection known to have a considerable inclusion of nickel carbide bound into the diamond structure. Indeed there may be as much as up to 3% of this foreign material present in the diamonds, and we believe that this included impurity content plays a considerable part in affecting the structures which will be reported here.

* Royal Holloway College, University of London.

Our studies here have been made with a high resolution phase contrast microscope of very great sensitivity. We have used this consistently for the study of many other crystals whose surface features we have also independently been able to examine with precision multiple beam interferometry. By studying step heights which have been accurately measured interferometrically we have learnt to assess the meaning of the intensity differences in our phase contrast instrument and can make shrewd assessments of heights of such steps with a good deal of confidence. So sensitive is the microscope when used at maximum contrast that we have established that the instrument has quite clearly shown up growth spirals on haematite crystals which interferometry proves to have a step height of a mere 2.3 AU. The optical system is therefore very sensitive indeed to step heights.

We find here that there are notable differences between the micro surface structures of the natural and the synthetic diamond cubic faces and as a preliminary, attention is first drawn here to the characteristic surface features which we have found as a result of an extensive survey of a large number of natural diamonds, a survey which has been steadily pursued for some 15 years. We have been engaged in comprehensive studies on diamond surfaces and have examined some thousands of faces, mainly octahedral and dodecahedral faces[2], but also a limited number of cubic faces. Because of the current emphasis which is so widely placed today on the theory of screw dislocations in crystals leading to spiral growth, especially at low supersaturations, we have diligently sought for growth spirals on diamond and have examined a comprehensive range from water-white pure gems to opaque industrial stones, from sizes beginning with the microscopic and going up to as much as 17

carats. To this purpose the techniques brought to bear have included the most refined optical techniques available, namely high precision multiple beam interferometry, sensitive phase contrast microscopy, light profile microscopy, oblique and dark ground illuminations and also the electron microscope. It is categorically asserted here that *not a single* trace of a growth spiral has ever yet been found on a natural diamond face despite the large number of diamonds studied. Many of these have surfaces of sufficient optical quality to reveal steps, if they are there, of less than 10 AU, but no spirals have been found. Indeed the only one single feature seen which at all faintly resembled a spiral, was established experimentally by us to be an incompleted percussion mark on an octahedron face, which crudely simulated a spiral pattern in its crack directions. It was certainly not a growth spiral and indeed neither in this laboratory nor elsewhere for that matter, have growth spirals ever been recorded on any faces of natural diamonds.

Although of course as a result of our studies a great mass of fine detail of surface microsctructure has been found, it will suffice to indicate here the very broad outlines of the typical features of the three more important types of face, the octahedral, the dodecahedral and the cubic faces. Octahedral faces invariably exhibit some growth trigons, and these may vary in number from a few to many millions. They are regular *strictly linear* equilateral triangular pits which can variously be either deep or shallow, flat bottomed or coming down to a point in pyramidal fashion. Often there are numerous small shallow pits, but a few angstrom units in depth, and it requires either a good interferometric or a refined phase contrast technique to show their existence. These pits are undoubtedly not etch pits for they lie oppositely oriented to etch pits ; they are growth trigons and arise essentially because the growth process on the octahedron occurs in plane wave fronts. The symmetry is such that completion of growth sheets inevitably leads to equiangular triangular depressions. As the crystal grows they fill in, but always, on the surface, when growth has stopped, there remain invariably some incompleted regions, hence some growth trigons.

We have found that the dodecahedral faces can show three different structure features, usually independently of each other but occasionally appearing together. These can be described respectively as, (a) striations, (b) oriented networks, and (c) curious elevated circular discs. The striations are typical of the striated faces often found on other crystals. The networks

Fig 1. Etch pattern on a cube face of a natural diamond (× 175).

may be oriented ruts, more rarely oriented ridges, and we have adduced some evidence that they arise during a solution process, having established also that the dodecahedral faces etch a good deal more easily than the octahedral faces. The elevated disks, which occur on quite a number of crystals are curiously overlapping disk regions and we tentatively believe that the diamond, during growth, has been in contact with small liquid or gaseous bubbles. After formation, and during the cooling off, there has been disolution on these dodecahedral faces

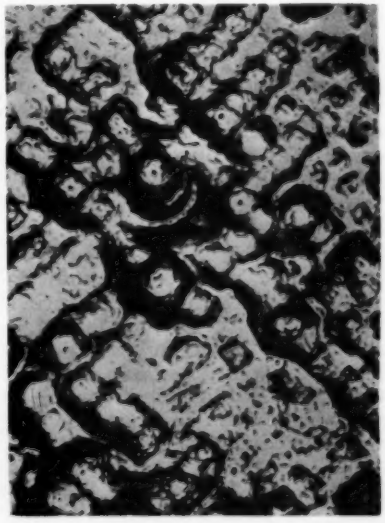


Fig 2. Enlarged view of part of the etch pattern in Fig 1 (× 650).

Fig 3. Square shaped depressions in cube face of natural diamond (× 650).

(they show etch pits). However the bubbles are now protective and prevent dissolution, with the end result that the crystal face is left with small disks standing proud. It is the slight micro-oscillations of these bubbles which are responsible for the multiple character of many of the disks.

We come now to the cubic faces. It has been stated by earlier authorities *eg* Williams[3] that natural cubic faces are invariably extremely rough. This we certainly can confirm, and there is little doubt that this roughness is largely responsible for the little interest usually taken in the past in the study of cubic faces. For in general there is little to be learnt. In view of our observations described later, on synthetic cubic faces, we have again turned our attention to natural cubic diamonds. Through the courtesy of Mr. R. G. Mason of Industrial Distributors, 53 selected natural cubes, large and small, have been made available to us. These we have examined with the phase contrast microscope, and a brief indication of the general character found will be given in the next section.

Fig 4 Further rectilinear patterns on natural diamonds cube faces (× 600).

Natural cubic faces

Of the 300 or so cubic faces available to us, the majority were indeed hopelessly too rough to be amenable to precision optical study. All but three of the cubes were Congo boarts and the colours varied from white (gem quality) through greens, greys and browns to black. We were able to study an appreciable number of faces, with the phase contrast miscroscope, in local regions and we find close similarity in the characters of those we could examine. So rough are the surfaces that structural detail could usually only be revealed by using the high magnification of x1000. A number of micrographs will be shown.*

The cube faces belonging to alluvial diamonds, may well have been subject to erosion processes. We do find two types of feature. In the one case we find etch patterns, in the other typical growth hollows. Plate 1 (x175) shows a typically etched surface, with the familiar type of oriented etch pattern which we have often produced artificially in the laboratory by etching with hot potassium nitrate. A closer look of such a surface is shown (x650) in Plate 2 and here the linear arrays of the characteristically rounded square shaped etch hillocks are clearly shown. The rough character of the surface needs no further emphasizing.

However, much more characteristic is the frequent appearance on cubic faces of numerous square shaped hollow depressions, with clearly marked terraced sides. Plate 3 (x600) is typical, but perhaps to better advantage is the surface shown in Plate 4 (also x600). Three features are easily recognisable namely, (a) the outlines of the patterns, although reasonably rectilinear are only crude squares, there is a good deal of deviation from the true geometrical outline. This is marked contradistinction to the beautifully regular equilateral triangular depressions so commonly found on the octahedral faces; (b) one can see quite clearly that often there are pits within pits and

* In reproduction, the original magnifications have been altered.

that whilst the surfaces within the pits are very rough, the local regions outside are at times reasonably uniform; (c) the sides of the pits are markedly terraced, invariably. Plate 5 (x1000) has been chosen as illustrating an unusually large pit (this is relative of course, for the length is actually a mere 1/12th mm). This shows the well-marked terracing which only appears to vanish as the pit is entered merely because the depth is so much that the lower part is well outside the depth of focus of the lens used to secure the high power picture. The pyramidal descending staircase character is well rendered. It will be noticed that the pit is rectangular rather than square, but this is not of much significance for after all the right-angle nature of the pit is what is significant, not whether it is rectangular or square.

It is a reasonable possibility that all the cubes have grown by a plane sheet mechanism, as revealed by the terracings. Just as with the trigons on the octahedral face so with the cubic depressions here, the incompletion of growth leaves a terraced pit because of the sheet character of the growth. In a sense these quadrilaterial pits on the cubic face are the close analogue to the triangular shaped trigon pits on the octahedral face. Indeed it would not be unreasonable to coin the name '*quadrons*' to match the name '*trigons*' for these depressions!

We are unable to find any trace whatsoever of any spiral growth on the cubic faces. True they are rough and crude, but here and there are small smooth regions and within these there are certainly no traces of spirals. The deep terraced regions are also certainly not spiral growths. They are in any case far too deep. Our quite considerable experience of spiral growths on quite a large number of different kinds of crystal points inexorably to the fact that spiral staircases are usually quite shallow. A spiral staircase of height as much as 1000 AU is a rarity indeed, and most of the many spirals we have studied by interferometry are shallower than this. Yet the quadrilateral pits are deep, almost macroscopically so. Furthermore, as will be shown later these depressions are entirely different to the true spirals we do find on synthetic diamond. Finally, most important, the repeated occurrence of spiral *hollows* would be a complete anomaly in growth spiral phenomena. True in one or two quite rare instances *shallow* hollow spirals seem to have appeared on silicon carbide crystals originating it would seem by a method of thermal etching. But they are unusually rare and completely different in character to

Fig 5. An unusually large square depression on the cube face of a natural diamond (approximately 1/12th mm in length) (× 1000).

our *deep* terraced pits. We are quite categorical on this matter. *There is not the slightest evidence for any spiral growth effect on natural cubic faces.*

Our new study of the recently acquired 53 cubic crystals therefore confirms our earlier opinion that no natural diamond exhibits growth spirals of any kind whether on octahedral dodecahedral or cubic faces.

Synthetic diamonds—dendrites

The first important distinction which we have found revealing a real difference between the synthetic and the natural diamond is the appearance amongst the synthetic diamonds of a number of true dendritic diamonds. As far as we know dendritic diamonds have not been reported amongst the natural crystals. Plate 6, at lower magnification than the previous plates (ie x120) shows typical dendrite crystals of synthetic diamond. Both show on their surfaces a characteristic 'herring-bone' pattern. This quite closely resembles the pattern we have found on some germanium dendritic plates in our possession. It will be recalled that germanium has the same crystal structure as diamond, but is of course a metal. We have never seen such typical curious dendritic crystals amongst natural diamonds, nor have we seen records of such in

Fig 6 (above). Typical dendritic crystals of synthetic diamond, apparently derived from octahedral forms (× 100).

the bibliography on diamond. Quite a number appear in our one carat batch of synthetic microcrystals. The dendrites appear to be based upon the octahedron form as judged from the 'herring-bone' angles.

Related to the appearance of these complete dendrites is an appearance on many other crystals which we are tempted to regard as a diamond dendritic surface overgrowth. Under high powers many of those crystals which exhibit octahedral faces show a streaky surface pattern like that shown in Plate 7 (x600). We are unable to remove this streaky pattern with heat or with acids. It may well be dendritic diamond. It may also possibly be metallic carbide overgrowth. Such a carbide would also be heat and acid resisting.

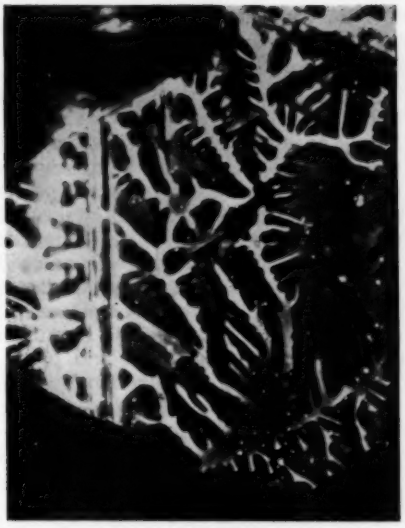


Fig 7 (right). Dendritic pattern on the surafce of a synthetic diamond (× 600).

It will be noticed that this particular octahedron face (it is about $\frac{1}{8}$th mm in length) reveals a number of distinct clear slip lines. Although such slip lines occasionally appear on natural diamond, we do feel that they are far more frequent on the synthetic crystals, and would actually consider this as another real difference between natural and synthetic diamonds.

The interpretation of this picture remains uncertain. For the GE group[1] maintain that the diamonds grow catalytically upon a carbide film and always include such metal carbide. It remains a possibility that the streak pattern is a residual carbide film. However it should be noted that the streak patterns only appear upon the octahedral faces, and as shown in Plate 6 the true dendrites are also based on the octahedron.

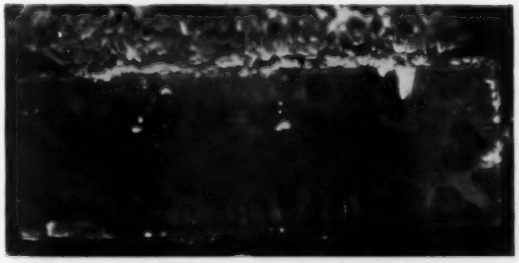


Fig 8. Cube face of a synthetic diamond; note the smoothness of the surface as compared with natural cube faces (× 500).

Synthetic cube faces of high perfection

We come now to another major distinction between the synthetic and natural diamonds and this refers to the quality exhibited by the cubic faces in the two types. Natural cubic faces, as already emphasized, are always very rough indeed. On the contrary some of the synthetic cube faces show a *remarkable smooth perfection*. A fine example is shown in Plate 8 (x500). Here we see a perfectly formed cube face, a rectangle of length $\frac{1}{8}$th mm. The photograph was taken with the phase contrast microscope set at maximum contrast sensitivity. The known performance of this instrument tells us that this cubic face is flat and plane overall to better than 50AU. The faint patchy markings may be diamond or may be surface impurity, but in any case they constitute a very thin film. This face certainly reveals a degree of smooth optical perfection not even remotely approached by natural cubic faces.

Such good synthetic cubic faces are in fact not uncommon and it is on such faces that we have found numerous well-defined growth spirals, an effect totally unexpected in diamond, judging by our previous experience with *natural* diamonds.

Growth spirals on synthetic diamond cubic faces

We have found numerous growth spirals on the good cubic faces of the synthetic diamonds and our most perfect example is shown in Plate 9 (x850). A high magnification is necessary for the whole face is a small rectangle (a mere 1/12th by 1/25th mm). The surface, of good optical quality, is shown at optimum phase contrast and exhibits a perfect, single, growth spiral. The centre of the spiral is the high region. This is a true spiral hillock, not a rectangular hollow. The spiral undoubtedly originates at a central screw dislocation. We are able to estimate that the step height of the spiral is some 100 AU and it appears to be quite uniform around the spiral arms, as indeed spiral growth theory predicts it should be.

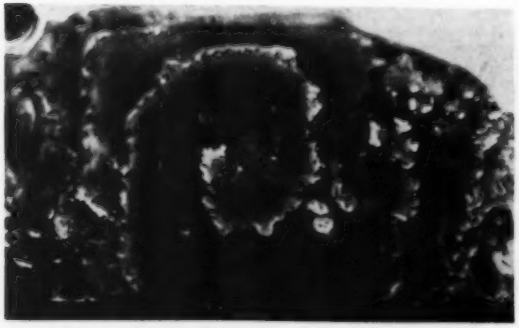


Fig 9. Growth spiral on a synthetic diamond cube face (× 850).

We are convinced that the spiral is diamond and not an impurity overgrowth and this conviction is based on several reasons. First is the fact that all attempts to remove the spiral with acids or heat have failed. Second, and far more conclusive is the information revealed by the fine structure of the spiral arms. For these arms are markedly kinked and when we look at this with higher magnification (x3000) it can be seen without any ambiguity whatsoever, that the separate component strips of the kinked arms are strictly rectangular in character. They are in fact parallel to the sides of the face of the rectangle. Clearly this proves that the spiral must be diamond, for were it due to a foreign overgrowth then for such rectangular fitting it would be necessary to postulate the existence of a film of some material overgrowth with a perfect epitaxial fit with the diamond lattice. This is so improbable that it can be rejected outright. There is one further detail which adds to the certainty that this spiral is diamond material. For, as so very frequently happens in true spiral growth, the spiral here starts out with a circular character and after a couple of turns quickly adopts the crystallographic orientation of the face on which it grows. Precisely this happens here, for after a couple of turns the initially curved spiral has become rectangular. Finally the very uniformity of the thickness of the spiral is evidence of a true screw dislocation spiral and not an accidental overgrowth.

There is no doubt at all that we are confronted here with a simple diamond spiral originating at a screw dislocation in the centre of what is otherwise a good cubic diamond face.

Although this particular spiral originates at the centre of a face, such a situation is in fact quite infrequent. We have observed a number of spirals and most tend to originate near one corner of a rectangular cubic face. Plate 10 (x1400) and Plate 11 (x1300) are much more typical. It will be noticed that the faces are quite small (near to 1/14th mm) and a higher magnification is used than before. The way in which the spirals begin at corners is clearly rendered. Plate 11 is of further interest in that slip lines crossing the cubic face are distinctly seen. There is a discontinuity in the spiral arms as each passes over the slip line.

Conclusions

It is now clear that the synthetic diamonds are clearly distinguished from the natural diamonds with respect to four distinct features namely:

Fig 10. Spiral form near one corner of a synthetic diamond cube face (× 1400).

(1) Dendritic crystals appear amongst the synthetics but not amongst the naturals;
(2) Often in the synthetics there are found cubic faces of good cubic rectilinearity and with outstandingly perfect finish, being flat and of high specular reflectivity. Such faces never appear on natural cubic diamonds;
(3) Slip lines appear quite frequently on synthetic diamonds but are relatively uncommon on natural diamonds;
(4) Growth spirals have been found on synthetic cubic faces, often a whole face being covered by a single spiral of but a few turns. No growth spirals have as yet been found on natural diamond faces although very large numbers of such faces have been critically examined.

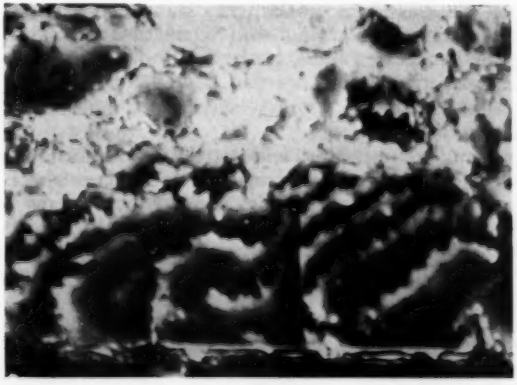


Fig 11. Another spiral near a cube face corner (× 1300).

With regard to these differences it seems self evident that they arise from differences in the mode of formation of the synthetic and the natural diamonds. There may well be numerous differences in the conditions in the two cases but at least two appear to be significant. In the first case the synthetics are grown rapidly, in less than 10 minutes. Such a rapid growth may well be conducive to dendritic growth to judge from experience with numerous other crystals. The existence of so many quite large perfect single crystals amongst diamonds in nature is virtually conclusive proof that the natural diamonds have certainly grown at a slower rate than these synthetics.

Then again the synthetics appear to grow catalystically at the interface between a high melting point metal (eg tantalum or nickel) and a mass of graphite. Between the metal and the graphite a metal carbide film forms and it is this which acts as the essential catalytic agent. It is fairly certain now that the synthetic diamond in its growth surrounds and occludes metal carbide and this may amount up to 3% of the diamond, a considerable impurity in comparison with pure gemstone natural diamonds, but not excessive in comparison with many boarts.

It is suggested that the metal carbide inclusion is responsible for the production of the dislocations which lead to the spiral growths. It may well be too that such inclusion leads to the dislocations associated with the frequently observed slip lines on the synthetic crystals. Both these two features can then be associated with the mode of formation wihch results in an impurity inclusion leading to dislocations.

Another point worthy of consideration is the perfection of the synthetic cubic faces. It has been stated that the synthetics formed at the lower temperatures are principally cuboid and at higher temperatures first dodecahedroid and then octahedroid forms appear. The relative overpreponderance amongst natural stones of the dodecahedra and octahedra and the paucity of natural cubes all show that the temperatures in natural diamond growth are higher than those of synthetic diamond growth. This very lower synthetic growing temperature may perhaps be linked with the more perfect synthetic cubic faces.

References

1) Preparation of diamond. H. P. Bovernerk, F. P. Bundy, H. T. Hall, H. M. Strong, R. H. Wentorf. *Nature* 1959 Vol 184 p 1094.
2) Microstructures of diamond surfaces, S. Tolansky, NAG Press, London, 1955.
3 Genesis of the diamond, A. F. Williams, Benn, London, 1932.

The Inspection and Maintenance of Diamond Wire-Drawing Dies

This article was prepared by a technical committee of diamond die users and manufacturers at the request of the Council of the British Diamond Die Federation. It was originally published in the Industrial Diamond Review in 1948, but as the issue in which it appeared is no longer available, and as recent enquiries have shown a considerable amount of interest in the subject, it has been decided to republish it for the benefit of those who have not seen it before. The permission of the British Diamond Die Federation is gratefully acknowledged.

Foreword

This article is mainly a plea for the better care and systematic inspection of diamond dies, which, though often not treated as such, are valuable tools and also delicate pieces of apparatus, whose useful span of life is frequently very seriously curtailed by careless handling, and sometimes even by abuse.

There can be no doubt that, even in the same wire-mill, the expectation of life of any given die will depend to a great extent on the operator who uses it; in other words, some operators appear to have far more die trouble than others. The same is true of wire-mills as a whole. About this there can be neither doubt nor mystery. Certain operators and certain mills get the best out of their dies, whilst others just grumble and do nothing about them except complain to the makers.

Die users are prone to criticise new dies which they have purchased, but sometimes show an unfortunate complacency and tolerance in respect to the conditions of dies which they have had in use for some time, or which have been re-bored.

Too often dies are abused, particularly when employed in trains by wire-drawers possessing more brawn than brain, who contend that if there are six dies in the train, five of them may be scratched out of shape, but if the sixth one is perfect, by some amazing providence this finishing die produce good, straight wire.

No management has the right to expect good performance, either in wire quality or die life, from inadequately maintained dies. It is a fatal misconception to believe that the intereste of production in the long run are served by keeping dies in use after they are in need of repair. It follows that it is essential to maintain a die reserve to carry out even the minimum amount of die maintenance.

Most of the larger wire-drawing mills in this country and elsewhere have well-equipped die servicing departments in the charge of experienced and skilled technicians backed by adequate die stocks. Unfortunately, the practices adopted by these technicians are often unknown to, and in some cases unsought by, the staffs in charge of smaller plants. The fact that the larger mills have found it financially and productively sound policy to equip, maintain and staff their die servicing departments is surely sufficient proof that this expense is more than repaid. It is just as important that smaller concerns should also make provision to ensure that every die produces the maximum yield of good-quality wire by maintaining a universally high standard. It is to such that these notes may possibly be of value.

Note.—In referring to the various zones of diamond die profiles, the terminology used is that employed in British Standard 1168-1944. Reference is also made to this Standard in connection with recommended methods of inspection and measurement of die sizes.

1) *Introduction*

Generally speaking, diamond wire-drawing dies undergo a repeated cycle of operation which can be described respectively as inspection, re-polishing or enlarging, and wire-drawing. This cycle is repeated until, for one or more of various reasons, the die is discarded.

The purpose of this article is to outline recommended procedures for inspection, enlarging and re-polishing and to draw attention to those aspects of wire-drawing which affect these operations. Diamond dies are used under radically different conditions for drawing different materials, but many of the techniques of die maintenance are independent of the particular metal for which the die is used. In this article it may be taken that unless specific reference is made to a particular metal, the information given applies to dies for the drawing of any material.

2) *Inspection*

In normal routine, a die is subjected to inspec-

tion after service in a wire-drawing machine and therefore requires cleaning before an appraisal of its condition can be made. This cleaning must be thorough.

(*a*) *Cleaning*

The normal treatment, which is adequate in the majority of cases, is as follows:—

(i) Immerse the die in a grease solvent such as carbon tetrachloride, trichlorethylene, benzene, xylol.

(ii) Insert a suitably shaped wood point,[1] which may be wrapped with cotton-wool, into the die aperture and rotate with pressure.

(iii) Repeat (ii) until the wiper comes away clean.

For very fine dies (e.g., 0.001 in. and smaller), this method may be impracticable, and in this case the best alternative is to immerse repeatedly in the solvent and after each immersion to suck the aperture clean and dry by placing the die on a flat pedestal with a central hole connected to a vacuum pump. (The use of compressed air is not advised unless the supply is very carefully dried and filtered).

Special cases, for which the above treatments are inadequate, are as follow:—

A die may be returned with a fragment of wire jammed in the aperture. This should always be removed by pressure from the back (exit side) of the die, using preferably a wooden point, a steel needle only being employed if the wooden point proves ineffective. If the die is a fine one and the wire concerned is tungsten or molybdenum, one method is to immerse the die in fused sodium nitrite and then to drop it into water. Two unfortunate consequences may, however, follow the use of this method, especially in the case of ultra-small dies: (1) a deterioration in drawing performance, and (2) a slight enlargement. It is therefore recommended that all dies of approximately 0.001 in. and under which become plugged with tungsten or molybdenum be de-mounted, treated with suitable solvent at room temperature and re-mounted.

A die used with a graphite-bearing lubricant may show a dense, hard layer of graphite in its entrance side which the solvent will not dislodge. This layer should be removed with a steel needle and the operation followed by solvent treatment.

The greatest care and skill should always be used in applying a steel needle to a die in either of the above circumstances, owing to the risk of a broken steel point lodging in the die aperture.

Marked difficulty in cleaning a die, particularly in the drawing zone, is an indication that its polish has been destroyed in service.

(*b*) *Method of examination*

The recommended apparatus for, and method of, examination are as described in Appendix B of British Standard 1168-1944. Also Appendix C of that Standard describes the recommended methods of gauging or sizing.

3) *Faults to be looked for*

The whole purpose of inspection is to arrive at a decision as to the most economical way in which the die can be reconditioned for further use. It is therefore necessary to decide what faults it presents for eradication.

(*a*) *Worn out of tolerance*

This fault is the concern of the wire-drawer rather than the die polisher, but the degree of wear may influence the decision of the re-polisher as to the size to which he will re-polish the die.

(*b*) *Drawing ring*

By this is meant a ring round the reduction angle of the die corresponding with the line of impact of the entering wire.[2] The depth of this ring has a marked effect on the number of useful lives given by the die, because its removal may entail a substantial degree of opening up of the die profile.

(*c*) *Exit chipping*

Unless due to defects in the diamond, this fault is usually attributable to an inadequate radius at the corner of the exit, or to the absence of the exit cone.

(*d*) *Ovality*[3]

A die may be reported by the wire-drawer to draw oval wire, but the fault may lie either in the die or in the drawing conditions. Inspection should indicate which is responsible.

Causes attributable to the die are:—

(i) Entrance and exit parts of the profile being non-concentric ("met off-centre"). This is a serious fault and may entail sacrifice of useful die lives by its eradication.

(ii) Diamond loose in its setting. The obvious remedy is to re-mount the diamond. As

1 A suitable form of softwood for this purpose is "pegwood" or "dowelling" in diameters of $\frac{1}{8}$ to $\frac{1}{4}$ in.

2 This ring is to be distinguished from a ring developed in polishing due to bad technique. It is convenient to use the terms "drawing ring" and "polishing ring" to make the distinction. Whilst a drawing ring is undesirable, it is not necessarily an indication of bad practice. For instance, in high-speed multi-die machines with long "setting-up" times, it may be economically justifiable to work a die long after it has developed a drawing ring, provided that the wire drawn through it continues to be satisfactory for drawing through the next die in the set.

3 When examining fine dies under a microscope, the appearance may suggest one of these faults in what is quite a good die. In cases of doubt, the final test is to draw wire through the die and examine the product. (See also the final paragraph of Section 6 regarding the pre-trial of serviced dies.)

die makers use different methods for die mounting, users are recommended to return dies for re-mounting to the maker.

Causes attributable to wire-drawing conditions are:—

(iii) Angular setting of die in die-holder.

(iv) Bad alignment of the machine causing the wire to enter and/or leave the die obliquely.

(v) Unsuitable gauge, or ovality, of wire fed to the die.

(e) *Loss of shape*

Loss of shape is due more to careless enlarging or re-polishing of the die than to faults in the operation of the wire-drawing machine. It should be the constant aim of re-polishing to preserve the correct shape at all times.

If incorrect re-polishing is repeated, the die shape may be affected in one or more of the following ways:—

(i) The relief may be absorbed by the enlargement of the bearing until it is virtually non-existent.

(ii) Similarly, the entrance may be obsorbed by the enlargment of the reduction angle until access of drawing lubricant into the die may be hindered.

(iii) The various zones of the die profile may not be merged smoothly into each other.

(f) *Cracks*[3]

Cracks may occur in a variety of directions, depending upon a number of causes which are not fully understood. They may also vary in size from complete cracks extending across the full cross-section of the stone to incipient cracks very small in size.

A die in which the diamond is completely cracked is generally useless. It is true that a cracked die will sometimes continue to function, but, if so, the wire drawn is usually scored and therefore useless as finished wire, whilst if the die is used in an intermediate position an undue strain is thrown upon the die which follows it.

4) *Diamond powders*

The quality of diamond powder used and the use of a suitable grade for a particular purpose are as important as the mechanical condition of the machine employed.

The most important requirement of a diamond powder is that its particle size should be uniform. In recent years improved methods of classification have been developed as a result of which powders superior to those classified by the simple gravity sedimentation method have become available, whilst a well-classified coarse powder does not have its vigour diminished by a mass of "fines," the inclusion of coarse particles in fine powder is likely to cause polishing rings.

A typical particle size specification offered by one supplier is as follows:—

Grade No.	Theoretical Range	Actual Range
10	0- 1 micron	0- 1 micron
20	1- 3 ,,	0.5- 3 ,,
30	3- 5 ,,	0.7- 5 ,,
40	5- 7 ,,	1.5- 7 ,,
50	7-15 ,,	2.0-15 ,,
80	38-43 ,,	38.0-43 ,,
90	43-74 ,,	43.0-74 ,,

A suitable liquid vehicle in which to suspend the powder is olive oil. The mixture should be of a thin, creamy consistency and should, of course, be well stirred before application.

5) *Machines*

These fall into two main groups, the distinction lying in the use of either a needle (e.g., as in the Pivot or Pohenkra types) or a wire (e.g., as on the Bsteh type). Needle machines may be either horizontal or vertical, whereas wire machines are almost invariably vertical. A feature common to both types is the revolution of the die at a moderately high speed. In older models the needle or wire was stationary, but recently movement of these elements has been introduced and this appears to have advantages.

Broadly speaking, needle machines are better suited for "heavy" work (such as re-shaping and "ripping" for re-sizing), whilst wire machines are more adapted for gentler processes (such as finish-polishing after "ripping" and light re-sizing). Therefore needle type machines are better suited to recondition the larger sizes of die, and wire machines for the smaller dies. Dies used for drawing tungsten wire less than about 0.002 in. dia. are treated exclusively on wire-type machines. In shops handling a wide variety of die sizes both types of machine should be installed.

An essential auxiliary to needle machines is a means of grinding the needle point to a controlled angle. This is necessary to ensure that the profile of the die be not radically altered during re-polishing, and to safeguard against the development of polishing rings.

The wire used on wire-type machines may be of copper, steel, tungsten or molybdenum, according to which is cheaper or more convenient. For very fine dies (below 0.001 in.), tungsten is often preferred.

6) *Treatment of faults*

(a) *Worn out of tolerance*

Clearly the aim here is to open up the die to the nearest larger size required by the wire-drawing department.

The types of machine used for the different stages of the re-polishing will depend on the amount of work to be done. Thus, for instance, an intermediate die of 0.040 in. used in continuous copper wire-drawing may require increasing in size by as much as 0.005 in., whereas a finishing die of 0.005 in. may need an increase of only 0.0002 in., and the whole procedure would obviously be different in the two cases. As mentioned above, needle machines would be used extensively in the first case, and followed by wire machines, whilst in the second instance needle machines may be hardly used at all.

The use of appropriate powders is important. The general principle to follow is the same as is observed in metallographic polishing, i.e., the use of successively finer grades, each grade being used until the marks left by the preceding grade have been removed. The degree of coarseness permitted at the commencement of operations therefore depends on the degree of opening up intended. If a very coarse grade is used and the amount of opening up required is small, the die may reach the desired size before all the coarse marks have been obliterated; on the other hand, the use of a needlessly fine grade at the commencement will waste time.

Therefore, whereas final polishing should always be done with the finest grade of powder (e.g., grade 10 in table in Section 4), the commencing grade will depend on the amount of work to be done. A little experience with a particular brand of powder and type of machine will enable a satisfactory procedure to be prescribed.

Three important points must be observed when enlarging dies. Firstly, the angles of the contour must be smoothly "blended"; this is usually achieved on a wire machine by using an off-set wire, or by using a machine in which the die rocks whilst rotating. Secondly, if the degree of enlargement has been sufficient to absorb the relief, this must be restored; this operation is conveniently done using a needle at the back of the die, following by wire polishing with an offset wire to "blend" the cone left by the needle with the parallel. Thirdly, if the entrance and approach angles have been encroached upon, they, too, must be restored.

A die worn out of tolerance has usually seen considerable service and other faults are frequently present.

(b) *Drawing ring*

If the drawing ring is not very deep it may be possible to remove it without unduly shortening the length of the die parallel, and, if so, the die can be put back into service at the size at which it came out. Being in the reduction angle of the profile, it can be removed by using a needle of the appropriate angle.

However, the drawing ring is often too deep to be removed without a marked effect on the length of parallel, and with its removal an increase in the die size become necessary. In this instance, the die is treated as if "worn out of tolerance."

In treating drawing rings, particular attention must be paid to the matching of the angle of the needle point with that of the reduction angle of the die.

(c) *Exit chipping*

The exit cone should be made larger until the chipped zone is eliminated, but the finished die should be examined carefully for residual incipient cracks.

If the chipping is serious, the die will have to be discarded.

Apart from defects in the stone, the commonest cause of exit chipping is the absence of an exit angle, or of a smooth blending of this with the parallel. As mentioned above, attention should be paid to these two points in all re-polishing work.

(d) *Ovality*

The treatment of a die which shows ovality usually consists of opening up to a larger size, the ovality being eradicated in so doing. Details of the procedure vary very much according to individual cases, but the general principle described under "Worn out of tolerance" should be followed.

It may be necessary to open up to an unusual degree before the ovality is corrected, thereby losing useful die life.

(e) *Loss of shape*

Loss of shape is referred to in Section 3 (e). It is avoided when enlarging a die by appropriately and systematically treating every portion of its profile. It is obviously important that needles must be ground to the correct angles and that the polishing head and polishing machine generally must be mechanically sound and true running.

(f) *Cracks*

If a die shows small incipient cracks, visible in the bore, it may be worth while to open up

to a larger size to determine whether these cracks will "polish out." If, after such treatment, they enlarge rather than disappear, it is unlikely that the die will withstand the stresses of wire-drawing.

Incipient cracks around the die entrance (i.e., not in the reduction angle or the bearing) do not as a rule prevent its further use.

To ensure that any of the above-mentioned treatments have been effectively carried out, a suitable opportunity should be taken before the die is returned to stock or to service to draw wire through it under normal operating conditions.

7) *Record of Die Performance*

The full advantage will not be obtained from the installation of a die maintenance procedure unless some record of die performance is maintained. By recording the amount of material drawn through the die, the operator, the wire-drawing machine used and the reason for the withdrawal of the die from service (including the degree of enlargment), data will be accumulated without which it is impossible to determine the relative importance of faults in wire-drawing practice and differences in die quality.

A New Hand Polishing Machine

A new hand polishing machine has been produced by Rudkin and Riley Ltd of Aylestore, Leicester, under the designation of Model 2006/3.

As can be seen from the illustration accompanying this description, the machine makes up a neat unit, complete with the electric motor and control gear. Two types of motor are available as alternative standard equipment, and each provides two running speeds (2400 and 3150 rev/min or 1200 and 1575 rev/min). The illustration shows the machine mounted on a cast column stand that is obtainable as an extra; the machine is normally supplied for bench mounting. Other additional items available include low-voltage lighting equipment, and an electro-magnetic brake.

The standard fittings include the adjustable handrest and the aluminium guard seen at the right.

Chucks of up to 7½ in. diameter can be fitted, and this allows a very wide range of articles to be accommodated in the machine.

Large taper roller bearings are standard, and the machine as a whole is sturdily built and designed to give long and trouble-free service. Maintenance has been simplified by the convenient positioning of the lubrication points.

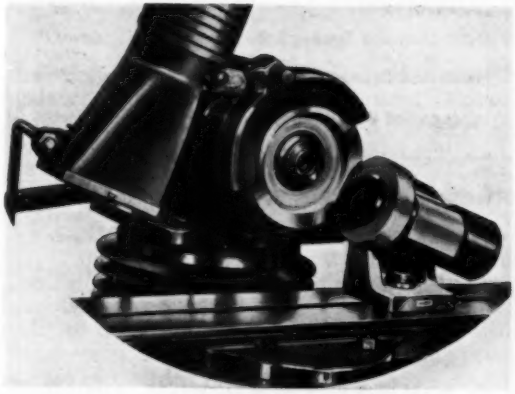
In the model as shown, the dimensions are:

Length	...	28 in.
Front to back		33 in.
Height	...	50 in.

The total weight is 3 cwt 3 qtr.

A Brake Dressing Tool

The Habit Diamond Tooling company has recently introduced a new brake operated diamond wheel dressing tool. As can be seen in the illustration, the equipment is compact, and, as it is attached by only one bolt to the grinding machine, its attachment and removal are both simple and rapid.



The action of this tool, marketed under the name of Rotatrim combines both truing to exact concentricity, with zero run-out, and dressing the face of the wheel to provide a free cutting surface.

The Rotatrim is designed for use on either resinoid or metal bonded wheels, and in use makes it as simple to dress a diamond wheel as any other abrasive wheel. It uses an inexpensive abrasive wheel as the truing medium, and needs no connection to any power source, being completely self-contained; accordingly, the maintenance required is simple and slight.

In operation, all that is necessary is to mount the tool so that it can be fed in to the wheel and simultaneously passed across it; as the two wheels come into contact, the rotating diamond wheel tries to drive the Rotatrim wheel against the resistance of its built-in brake, and so provides the dressing action, with a constantly changing dressing surface.

New Wolf Service Branch Opened at Bristol

The Bristol Branch of Wolf Electric Tools Ltd has moved into new and larger premises at 1-3 Dean Street, Bristol 2.

The repair shop—equipped with modern machinery and electrical testing plant, including 3,000v apparatus for testing Wolf double insulated tools—is fully organised to give immediate attention to all service matters.

Wolf tools requiring attention can be sent to or taken to the Branch and upon request a quotation for repairs can be given on the spot or by telephone and work put in hand at once thus saving valuable time. Telephone orders for spare parts received before 3 p.m. are dealt with on the same day. In very urgent cases by telephoning the Wolf Branch Manager in advance, arrangements can be made for a repair to be effected while the customer waits.

Occasionally it may happen that a machine engaged on particularly urgent work sustains damage necessitating a major repair. In such emergencies a machine of the same or similar type can always be loaned from the Branch so that the job can go on while the customer's machine is being serviced.

The original Wolf Service Branch at Cheltenham Road has been vacated and all enquiries should be made to the new Dean Street address, Telephone No. Bristol 22288.

News Items

(1) Mr. Pinhas Sapir, Minister of Commerce and Industry of Israel, speaking at a meeting of the Labour Council of the immigrant town of Beit-She'an, declared that a diamond polishing centre is to be established there. It will employ 150 workers.

(2) Israel's exports during September 1959 totalled $11,900,000: nearly twice the September 1958 figure. The steady increase in sales abroad since April has brought total exports close to $140 million for the January-October period: nearly $30 million more than last year. Diamond exports alone are $9 million up on last year, and the rate of added value is higher.

THE HENDERSON DIAMOND TOOL COMPANY LTD.,

43-45 ALLESLEY OLD ROAD, COVENTRY

Telephone : Coventry 75617

MANUFACTURERS OF DIAMOND TOOLS.

ALL TYPES OF ABRASIVE DIAMOND TOOLS

RESET AND RETURNED WITHIN **48 HOURS**

OF RECEIPT AT THE ABOVE OFFICE.

TOOLS FOR SPECIALISTS MADE TO CUSTOMERS OWN REQUIREMENTS

CLASSIFIED ADVERTISEMENTS

2d. *a word, minimum* **4/-.** *Box Numbers* **1/-** *extra.*

Address Box No. replies to : N.A.G. PRESS, LTD., 226 Latymer Court, London, W.6.

TIME RECORDERS.—Sales—Rental Service. Tel. HOP. 2239. TIME RECORDER SUPPLY & MAINTENANCE CO. LTD., 157/159 Borough High Street, London, S.E. 1.

MR. M. DAVIDSON, F.S.M.C., qualified opthalmic optician, is in constant attendance, for sight-testing and dispensing of optical prescriptions, at the HATTON OPTICAL CO., 19 Hatton Garden, E.C.1. (Tel. HOL 8193).

DIAMOND POWDERS mesh and microns, purity 98/99% available. Also diamond splinters. Inquiries: **AFRIKA DIAMANT BOART, 24 VESTINGSTRAAT, ANTWERP, BELGIUM.**

WE MANUFACTURE diamond tools, wheels and lapping compounds. NATIONAL DIAMOND LABORATORY, Peekskill, N.Y., U.S.A.

REQUIRED by firm of machine tool importers, a representative with sound connections in the optical and engineering industries, must also have knowledge of diamond tools. Salary and commission, car owner, but not essential. BOX 2098.

I WISH TO BUY Diamond Milling Machine for powder production and apparatus for mechanical size segregation of diamond flats and points. Offers to Postbox No. 76, Antwerp, 1, Belgium.

SWISS MADE MACHINES for jewel bearing production for sale. Adaptable for machining quartz, carbide, ceramics, germanium, sapphire. **JAMES MELLING, LIMITED,** 113 Bedford Road, **ROCK FERRY.** Rock Ferry 711.

THE DIAMOND NEWS
and
SOUTH AFRICAN JEWELLER

(Official organ of S.A. Jewellers Association, Ltd.)

The Voice of the Diamond Industry

- The only magazine of its kind on the African Continent ; circulates throughout the World, including Russia.
- Many of our supporters are your front-line ambassadors on whose goodwill and co-operation much depend ; reach these potential buyers and sellers through this medium.
- A monthly magazine containing approximately 70 pages of text matter, suitably illustrated.

Subscription Rates, per annum 33/- (Post free)

For information on Rates and spaces available, write :—

Advertising Manager,
P.O. Box 361,
KIMBERLEY,
South Africa.

ADVERTISERS' INDEX

	Page
Diamant Boart	3
Diamond News, The	20
Drukker, D. & Zn. N.V.	4
Habit Diamond Tooling Ltd.	Cover III
Henderson Diamond Tool Company, Ltd., The	19
Impregnated Diamond Products Ltd. ...	Cover IV
Indusmond (Diamond Tools) Ltd	1
Industrial Diamond Co. (Sales) Ltd. ...	Cover II
Triefus & Co. Ltd.	Cover I
Wolverhampton Diamond Die & Tool Co. Ltd.	3

o

● PUBLISHERS : N.A.G. PRESS, LIMITED 226 Latymer Court, Hammersmith, London W.6, England Telephone : RIVerside 2143

o

Contributions of scientific, technical and practical interests and news items are invited, but responsibility cannot be accepted for the safety of MSS, drawings, photographs or other matter submitted. Unaccepted matter will be returned.

o

Information of Rates and spaces available for Trade Advertisements will be forwarded on request. I.D.R. is published monthly on the 18th at 1/3 a copy. It is obtainable through Newsagents and Booksellers, or by Postal Subscription, 15s. a year post free, from the Publishers' address above.

Subscriptions in U.S.A $2.50 are received by the usual U.S.A. Subscription Agencies or direct from the Publishers, address as above.

INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1960 Volume 17
JANUARY

CHANGES IN SUBJECT HEADINGS

Owing to recent technological advances, the balance of subject matter in Industrial Diamond Abstracts has altered slightly over the past few months. In recognition of this change and for the sake of greater clearness, some new subject headings have been adopted and some material has been rearranged.

(1) ' Physical, Chemical, and Mechanical Properties of Diamond and Other Hard Materials ' has been sub-divided : the properties of diamond will be dealt with separately from those of other hard materials as a result of the increasing prominence of synthetic diamond.

(2) ' Diamond, *etc*, in Instruments ' will include ' Surface Finish Testing.'

(3) ' Fine Boring and Fine Turning of Metals ' becomes ' Precision Machining of Metals.'

(4) ' Cutting and Machining of Glass ' will be covered in the section ' Cutting and Machining of Stone, *etc*,' as will such materials as plastics, ceramics and quartz.

(5) ' Grinding and Polishing of Hard Metals ' becomes ' Grinding and Polishing of Carbides and Metals.'

(6) ' New Machining Methods ' becomes ' Machining Developments.'

(7) ' Powder Technology ' becomes ' Powder Metallurgy.'

(8) ' Diamond Recovery ' will be found under a section called ' Production, Grading and Recovery of Abrasive Particles.'

Standardized Abbreviations

In future, the titles of journals abstracted in Industrial Diamond Abstracts will be abbreviated according to the World List of Scientific Periodicals (Third Edition), but full stops after abbreviated words will be omitted. For example, *Industrial Diamond Review* becomes *Industr Diam Rev*, and not *Industr. Diam. Rev.*

Other abbreviations used, *eg* the names of units, will comply with British Standard 1991: Part 1: 1954 (Letter Symbols, Signs and Abbreviations).

CONTENTS

Diamond Mining and Industry	A2	Rock Drilling	A13
Physical, Chemical, and Mechanical Properties of Diamond	A2	Wire Drawing	A15
Physical, Chemical, and Mechanical Properties of Hard Materials	A4	Grinding and Polishing of Carbides and Metals	A15
Diamond, etc, in Instruments	A5	Machining Developments	A20
Hardness and Wear Testing	A6	Production, Grading and Recovery of Abrasive Particles	A21
Truing of Grinding Wheels	A7	Tool Production	A21
Precision Machining of Metals	A9	Powder Metallurgy	A23
Cutting and Machining of Stone, Glass, etc	A11	Miscellaneous	A24
Gem Polishing	A12	Book Reviews	A25
		Trade Literature	A26
		Patent Lists	A26

DIAMOND MINING AND INDUSTRY

Alluvial diamond returns for August 1959

Anon. *Diamond News* 1959 Vol 23 (1) pp 31-32 (Oct)

Rough and uncut diamond production in August 1959 for Cape Province: 5,216.50 ct of total value £50,200 (192s 6d per ct); Private Estates: 257.50 ct of total value £4,786 (371s 8d per ct); Transvaal Province: 16,158.00 ct of total value £48,684 (60s 4d per ct). Thus, total production amounted to: 21,632.00 ct of total value £103,670 (95s 10d per ct).

M *Ebe F.13.361*

Five years of the Panna diamond mining industry (1953-1957)

S. M. Mathur. *Indian Min, Calcutta* 1958 Vol 12 pp 297-305 (Oct-Dec); *IMM Abstr* 1959 Vol 10 (1) p 30 (Oct-Nov)

D *F.25.371*

Diamonds from the stockpile. Diamanten aus dem Stockpile

Anon. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (10) p 602 (Oct) (In German)

Stocks of industrial diamonds belonging to the USA Government are likely to be sold out in the near future.

A *Fc.141.342*

Mining miscellany

Anon. *Min J* 1959 Vol 253 (6483) p 513 (Nov 20)

Two local diamond mining firms, the Lebafric Diamond Mining Co and Minerals Research (Sierra Leone) Ltd, have been set up in the Simbaru Chiefdom in Kenema District, Sierra Leone.

D *F.25.3672*

Without trumps ?

J. Nutkewitz. *Diamant* 1959 Vol 3 (16) pp 9-14 (Oct-Nov) (In French, Flemish and English)

The problems of Antwerp as a diamond cutting centre include lack of Government assistance, compared with Israel and Germany, and an inadequate supply of rough diamonds.

D *F Hl.25.3235*

School of diamond polishing

Anon. *Gemmologist* 1959 Vol 28 (339) p 194 (Oct)

The first diamond polishing school will be opened soon in Tel-Aviv under the sponsorship of the Ministry of Labour, in co-operation with the Diamond Workers' Union.

D *F Hp.17.351*

Israeli diamonds for Canada

Anon. *Gemmologist* 1959 Vol 28 (339) p 188 (Oct)

Israel's annual diamond exports to Canada may be doubled as a result of an agreement between Yalom-Gem Ltd, of Montreal, and the Israeli Ministry of Commerce and Industry. The firm will be supplied by a diamond cutting centre now being built in Jerusalem. An important factor is Yalom-Gem's undertaking to supply the rough diamonds needed for their purchases, thus providing Israel with raw material above its world syndicate quota.

D *F.251.351*

Diamonds—Sierra Leone

Anon. *Miner Tr Notes* 1959 Vol 49 (5) p 51 (Nov)

The Government-sponsored bill entitled 'An ordinance to ratify and confirm an agreement for the export of alluvial diamonds' was enacted into law by Sierra Leone's House of Representatives on July 31, 1959.

X *F.251.3672*

Market reports

S. Emmerik, *etc. Diamant* 1959 Vol 3 (16) pp 25-32 (Oct-Nov) (In French, Flemish and English)

Reports on the following diamond markets: Antwerp, New York, Tel-Aviv, Amsterdam, London, Paris, and Rome.

D *F.251*

PHYSICAL, CHEMICAL & MECHANICAL PROPERTIES OF DIAMOND

[De Beers making synthetic diamonds]

Anon. *Daily Telegraph* 1959 (Nov 18); *Times* 1959 (Nov 18, 19); *Financ Times* 1959 (Nov 18, 21)

Mr. Harry Oppenheimer, chairman of De Beers, announced on November 17 that a method of producing synthetic diamonds had been developed in Johannesburg by the Adamant Laboratory research team, led by Dr. J. F. H. Custers. The diamonds, in effect abrasive grit suitable for use on resinoid-bonded grinding wheels, are of the same type as those made by GEC of America since 1955, but it is not yet certain whether the two processes are the same. Applications for a patent have been filed throughout the world, and although manufacturing is still at the laboratory stage, the company is confident that it will be technically and economically feasible to manufacture on a commercial scale, if it finds this desirable. There is no question of making gem diamonds, and Mr. Oppenheimer stressed that as yet synthetic stones could only compete in a limited industrial field: however, any decision as to marketing the new grit would be taken in close cooperation with the Belgian Congo Société Minière du Beceka. The ultimate effect would probably be a greatly expanded market in which both natural and synthetic diamonds would find their place.

Dr. J. F. H. Custers told the press conference that work started in 1955 with the building of a pressure chamber which could withstand pressure and contain temperatures at the high levels needed for diamond synthesis. The first diamond was produced in September 1958. It measured 0.4 mm by 0.25 mm and consisted of six equal-sized particles closely cemented together. Thousands of experiments were made prior to final patent applications a year later. Continuous production was established in September, 1959. Although subsequent experiments showed that different types of material could be produced, at this stage only the manufacture of one type of grit was practicable.

D *Fh Ha*

The production of synthetic diamond

Anon. *Mfg Optic* 1959 Vol 12 (11) p 39 (Nov)

Reviews information released by GEC's chemistry research department. Some of the conditions peculiar to the formation of diamond are listed. It is noted that all the observed cases of diamond preparation in the authors' laboratory have occurred at pressures and temperatures appropriate for the thermodynamic stability of diamond. Yet diamond does not always form where it is thermodynamically stable. Many of the physical characteristics of natural diamonds have been duplicated in the laboratory.

D *Fh Ha*

Spiral and other growth forms of synthetic diamonds : a distinction between natural and synthetic diamond

S. Tolansky, I. Sunagawa (University of London). *Nature, Lond* 1959 Vol 184 (4698) pp 1526-1527 (Nov 14)

Specimens of micro-diamonds made synthetically by GEC are being examined in detail, using both interferometry and a particularly sensitive phase contrast microscope. Three characteristics observed are described : (i) A few cubic faces have a smooth optical finish : such smooth perfection on cubic faces is quite unknown on natural diamonds, although occasionally found on natural octahedral faces ; (ii) Quite a number of synthetics reveal a new form modification : typical dendrites. These usually appear as network overgrowth ; slip effects are also clearly visible. The markings are believed to be diamond since neither strong heat nor chemical reagents affect them. More striking is the rare occurrence of complete dendritic crystals of a kind which have never been reported for natural diamond to the authors' knowledge ; (iii) The most notable observation was of several spiral growths on a number of good-quality cubic faces.

The authors comment on the fact that these microcrystals were grown rapidly, which is probably far from the case with natural diamonds. A second point is that, according to Dame Kathleen Lonsdale, this type of synthetic diamond may include up to 3% impurity in the form of metal carbide, which could be responsible for the appearance of the dendritic form and of the spiral dislocation. A subsequent examination of several well-formed natural cubic diamonds, clearly containing impurity, confirmed the complete absence of growth spirals on natural diamond faces. The authors hold strongly to the view that both the spirals and dendrites are due to some special causes distinguishing the synthetic from the natural diamond. These may be due to different conditions during formation or alternatively to metal carbide inclusion. 6 illustr.

D *F Ub*Fh Ub*

Preparation of diamond

H. P. Bovenkerk, F. P. Bundy, H. T. Hall, H. M. Strong, R. H. Wentorf jun. *Nature, Lond* 1959 Vol 184 (4693) pp 1094-1098 (Oct 10)

An interim report describing the salient features of the knowledge obtained so far, rather than a complete exposition of diamond formation. 11 illustr, 10 ref.

D *F Hb*

The synthetic diamond. Der synthetische Diamant

E. Guebelin. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (10) pp 600-602 (Oct) (In German)

See also *Diamant* 1959 Vol 2 (10-11) pp 14-19, 22-23 (Mar-Apr) ; abstr *Industr Diam Abstr* 1959 Vol 16 p A104 (June) (Original in French and Flemish, abstr in English, transl in German). *A* *Fh Ha*

More man-made diamonds in near future

Anon. *Diamond News* 1959 Vol 23 (1) pp 17, 19 (Oct) ; *Financ Times* 1959 (21897) pp 6, 9 (Oct 5) ; abstr *Industr Diam Abstr* 1959 Vol 16 p A202 (Nov)

D *Fh Ha*

Improved method of manufacturing diamonds from graphite

Anon. *Engrs' Dig* 1959 Vol 20 (11) p 437 (Nov)

Describes a recently patented Dutch process, intended for the production of diamonds of relatively large size, in which high dynamic pressures, as opposed to the more conventional high static pressures, are used.

D *Fh Ha:Bhb*

GE divulges secret of man-made diamonds — a catalyst does it

General Electric, Schenectady, NY. *Prod Engng, NY* 1959 Vol 30 (48) pp 41-42 (Nov 23)

D *Fh Ha.21*

Design and applications of the electron microscope

H. Mueller. *Jena Rev* 1959 Vol 4 (5) pp 147-153 (Oct) (In English)

Amongst the photographs illustrating the wide use of the electron microscope is one showing the surface of a diamond. 17 illustr.

M *F Unf.582/Wcmm.1451/Wcmm.256*

Carbon

L. Sanderson. *Canad Min J* 1959 Vol 80 (7) pp 78-81 (July)

The three allotropic modifications of carbon are : diamond, graphite, and amorphous forms. Diamond and graphite are crystalline, while the amorphous forms are sometimes without any specific structure although some variations do reveal a crystalline structure under X-rays which is not unlike that of graphite. Coal is not a genuine carbon, being impure, but anthracite is 93-95 per cent pure carbon, and a pure amorphous carbon can be obtained from pure sugar cane. The raw materials for making carbon and graphite are numerous. Because carbons sublime at about 3,600 to 3,700° C before melting, they cannot be sintered in their pure state but require a bonding agent if they are to be bonded together. A low thermal coefficient and therefore a high resistance to thermal shock render carbon important in metallurgy, and although itself abrasive it can be machined quite easily to fine limits. Uses in modern industry are varied.

A *Bhb U/F U*

Working life for a gem

Anon. *New Scientist* 1959 Vol 6 (158) p 1053 (Nov 26)

Synthesis of diamond, as pioneered by GEC in America, depends on a critical combination of high pressure and temperature as well as the agency of a metal catalyst (nickel) to transform carbon into diamond. Particulars of the Johannesburg synthesis are not yet available, but it is claimed that the two products are very similar and comparison of X-ray photographs confirm this. Structurally, synthetic diamonds resemble the natural variety but they contain small impurity centres where the catalyst has been trapped.

Since these synthetic diamonds are composed of layers of small crystallites, they disintegrate readily and cannot be used with metal and ceramic grinding wheels, which normally have to withstand high pressures. This brittleness is, however, a positive advantage in resin-bonded wheels, used for light finish grinding, as small sections of diamond simply break away as they wear blunt and expose new, sharp edges.

D *Fh Ha*

REQUESTS FROM AMERICA

American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.

PHYSICAL, CHEMICAL & MECHANICAL PROPERTIES OF HARD MATERIALS

Machining by removing chips; physical processes brought into play. Usinage par enlèvement de copeaux : processus physiques mis en jeu

R. Jouty. *Machine-Outil Franç* 1959 Vol 24 (148) pp 77, 79, 81, 83, 85, 87, 89 (Nov) (In French)

In ascertaining the processes involved in chip machining the nature of the chip itself is studied as more likely to provide useful information than the type of surface machined. The effect of chipping, the role played by friction, the deformation and constriction involved, and the orientation of sliding planes according to the theories of Piispanen and Merchant, are all discussed. 5 illustr, 8 ref. *A* *Ceq.21*

Examination of the precipitates in an alloy of aluminium and silver by the microtome method. Elektronenmikroskopische Untersuchung der Ausscheidungen in einer Aluminium-Silber-Legierung mit der Duennschnittmethode

L. Reimer. *Z Metallk* 1959 Vol 50 (10) pp 606-610 (Oct) (In German)

Precipitates in an alloy with 15% silver are investigated on thin cuts, prepared by diamond knife and ultramicrotome. In the early stages of precipitation, lattice disturbances can be made visible, which are apparently connected with Guinier-Preston-Zones. 8 illustr, 7 ref. *A* *Bfa Ceg Nfm/Bfa Ceg Nfn/Bfa Ceg Pdm*

Magnetic-ion interaction in $Gd_3Mn_2Ge_2GaO_{12}$ and related garnets

M. A. Gilleo, S. Geller. *J Appl Phys* 1959 Vol 30 (4) pp 297-298S; *Amer ceram Abstr* 1959 Vol 42 (11) p 288 (Nov)

D *Bbh Uf*

Magnetic properties of the rare earth garnets

R. Paythenet. *J Appl Phys* 1959 Vol 30 (4) pp 290-292S; *Amer ceram Abstr* 1959 Vol 42 (11) p 288 (Nov)

D *Bbh Uf*

Elastic moduli of polycrystals in relation to the constants of monocrystals. Sui moduli elastici dei policristalli in relazione alle costanti dei monocristalli

R. Colombo. *Metallurg ital* 1959 Vol 51 (10) pp 466-467 (Oct) (In Italian)

15 ref, 1 table. *M* *Bf Uncb*

Edge forms of the cubic system

S. Sh. Gendelev, I. I. Shafranovskii. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 407-416 (July-Aug) (Original in Russian)

The results of a derivation of edge forms for the cubic system are given. Tables are presented which depict all the edge forms of symmetry class O_h, as well as tables with the symbols of the face forms on which they are present. The number of edge forms for all five classes of symmetry in the cubic system are indicated. 5 illustr, 4 tables. 10 ref. *X* *Bc Ubc*

A new nitride precipitate in iron-silicon alloys

G. R. Booker, J. Norbury (Richard Thomas & Baldwins Ltd, Aylesbury, Bucks). *Nature, Lond* 1959 Vol 184 (4695) pp 1311-1312 (Oct 24)

2 illustr, 4 ref. *D* *Bfxfz.21*

Studies in the system iron oxide—titanium oxide

J. B. MacChesney, A. Muan (Pennsylvania State Univ). *Amer Min* 1959 Vol 44 (9-10) pp 926-945 (Sep-Oct)

3 illustr, 28 ref, 3 tables.
M *Rmb Rmk.21*

A survey of palaeomagnetism

D. W. Collinson, A. E. M. Nairn. *Overseas Geol & Miner Resour* 1959 Vol 7 (4) pp 381-397

The occurrence of magnetism in rocks is caused by inclusions of small amounts of ferromagnetic minerals. In a study of the magnetic properties of rocks, therefore, cutting and polishing of rock samples is necessary, in order to reveal the composition of the rock. Samples are first cored and sliced into disks or small cylinders by instruments with diamond impregnated phosphor-bronze cutting edges. Orientation lines are carefully preserved and drawn in ink. The magnetism measuring instruments are of two types : the astatic magnetometer and a rotating or 'rock-generator' magnetometer. Results are compared and discussed. 9 illustr, 3 plates, 2 tables, 43 ref. *A* *Uf.21*

Refraction, absorption and biabsorption in synthetic ruby

J. A. Mandarino (Univ of Michigan). *Amer Min* 1959 Vol 44 (9-10) pp 961-973 (Sep-Oct)

Refractive indices, absorption coefficients, and biabsorption are determined for two synthetic ruby samples. 6 illustr, 7 tables, 9 ref.
D *Bbeb Ukjc/Bbeb Ukk*

Red-luminescing quartz

E. W. Claffy, R. J. Ginther (US Naval Res Lab, Washington). *Amer Min* 1959 Vol 44 (9-10) pp 987-994 (Sep-Oct)

Red-cathodoluminescent quartz has been synthesized from amorphus silicic acid containing minor amounts of Al^{+3} and Mn^{+2}, in a reducing atmosphere at 1200° centigrade. 1 illustr, 26 ref.
M *Bcbz Ct*

Growing of crystals of L-rhamnose monohydrate and and study of their dielectric, piezoelectric, and elastic properties

A. A. Chumakov, I. M. Sil'vestrova, K. S. Aleksandrov. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 478-480 (July-Aug) (Original in Russian)

Crystals of L-rhamnose monohydrate have been grown. Their dielectric, piezoelectric, and elastic constants have been determined by dynamic methods. It is shown that a combination of the impulse method of measuring the elastic moduli of a crystal with the resonance method of determining its piezoelectric moduli enables the measurements to be simplified. 2 illustr, 7 ref, 1 table. *X* *Bc Ub.21*

The X-ray determination of the orientation of a crystal

A. I. Komkov, V. A. Frank-Kamenetskii. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 516-524 (July-Aug) (Original in Russian)

The construction of the projection of a plane and of a lattice row in an arbitrarily oriented crystal from a single Laue diagram, using the method of zonal development is examined. Methods of determining the crystal symmetry and the orientation of the crystal from the projection are described. 4 illustr, 5 ref.
X *Bc Cz Ubc*

The determination of the orientation of single crystals from Laue diagrams

S. S. Kvitka. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 525-526 (July-Aug) (Original in Russian)

2 illustr, 3 ref. *D* *Bc Cz Ubc*

The inherent symmetry of atoms and molecules in a crystal

A. V. Shubnikov. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 527-529 (July-Aug) (Original in Russian)

2 illustr, 5 ref. *D* *Bc Ubc*

Growth of large diameter silicon and germanium crystals by the Teal-Little method

W. R. Runyan. *Rev sci Instrum* 1959 Vol 30 (7) pp 535-540 ; *Bull Brit non-ferr Met Ass* 1959 Vol 39 (364) p 538 (Nov)

D *Bfr Ubz/Bhc Ubz*

Hardness and brittleness of compounds of metallic character

G. V. Samsonov, V. S. Nespor, L. M. Chrenova. *Hutn List* 1959 Vol 14 (6) pp 484-489 (June) (In Czech)

10 illustr, 19 ref, 2 tables.

A *Bfx Unh/Bfx Unt*

Magnetic anisotropy in manganese-iron spinels

R. F. Penoyer, M. W. Shafer. *J appl Phys* 1959 Vol 30 (4) pp 315-316S ; *Amer ceram Abstr* 1959 Vol 42 (11) p 288 (Nov)

D *Bbfz Uf*

A combined optical-mathematical-analytical method of determining the stress condition in disks. Ein kombiniertes optisch-mathematisch-analytisches Verfahren zur Bestimmung des Spannungszustandes in Scheiben

U. Wegner. *Metall* 1959 Vol 13 (12) pp 1105-1107 (Dec) (In German)

A *Cz Pz Unq*

The maximum tool life of hard cutting materials and their resistance to change at high temperatures. Ueber das Standzeitmaximum harter Schneidwerkstoffe und ihre Wechselfestigkeit bei hoeheren Temperaturen

W. Dawihl, G. Altmeyer. *Metall* 1959 Vol 13 (12) pp 1116-1117 (Dec) (In German)

2 illustr, 11 ref, 2 tables. *A* *Pd Uq*

Stress behaviour of brittle materials

E. B. Shand. *Bull Amer ceram Soc* 1959 Vol 38 (11) pp 653-660 (Nov 15)

12 illustr, 23 ref. *M* *Ba Unq*

Friction and wear

W. W. Shugarts jun. *Mech Engng, NY* 1959 Vol 81 (10) pp 58-60 (Oct)

43 ref. *M* *Unq/Unr*

Recent trends in crystallography

S. Ramaseshan. *Curr Sci* 1959 Vol 28 pp 349-350 ; *Insdoc List* 1959 Vol 6 (20) col 1582 (Oct 16)

D *Vh.132*

Electron-microscopic studies of oriented growth

H. Schneider. *Jena Rev* 1959 Vol 4 (5) pp 154-155 (Oct) (In English)

7 illustr, 2 refs. *M* *Ubz Wcmm.21*

Universal stage accessory for direct determination of the three principal indices of refraction

R. E. Wilcox. *Amer Min* 1959 Vol 44 (9-10) pp 1064-1067 (Sep-Oct)

With rare exceptions, only two principal indices of refraction of a biaxial crystal can be determined directly on the universal stage by the immersion method. A simple expedient, enabling direct determination of all three indices on a single grain, consists of mounting the grain on a spindle placed between the universal stage hemispheres in a slotted metal plate of the same thickness as the spindle. The procedure is described : it can also be applied in orientating a uniaxial crystal grain. 1 illustr, 7 ref. *D* *Cz Ukk.21*

The symmetry of the complete twin

H. Curien, J. D. H. Donnay. *Amer Min* 1959 Vol 44 (9-10) pp 1067-1070 (Sep-Oct)

5 ref. *M* *Ube.21*

Graphite—how it compares with metals, ceramics

G. B. Engle, L. M. Liggett. *Mater in Design Engng* 1959 Vol 49 (6) pp 88-90 ; *Amer ceram Abstr* 1959 Vol 42 (11) p 285 (Nov)

D *Bf*Bhb/Bhb*Bl*

The prized chrysoberyls

R. Webster. *Gemmologist* 1959 Vol 28 (339) pp 190-194 (Oct)

Describes the mineral chrysoberyl, which produces predominantly green gemstones with special optical properties. 2 illustr. *D* *Bbjz Uk*

Synthetic star corundum. Synthetische Sternkorunde

W. F. Eppler. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (10) p 599 (Oct) (In German)

4 illustr. *A* *Bbcb*

DIAMOND, ETC, IN INSTRUMENTS

The importance of the ' cut-off ' in surface testing by means of tracer cutting devices. Die Bedeutung des cut-off bei der Oberflaechenpruefung mit Tastschnittgeraeten

H. Wolff. *Werkst u Betr* 1959 Vol 92 (11) pp 817-820 (Nov) (In German, abstr in English)

In order to suppress the waviness when checking technical surfaces electrical filters have been incorporated in the measuring devices. The mode of operation and influence of these filters are described and illustrated by examples. In connection therewith important viewpoints follow which will have to be taken into consideration when using these filters. 7 illustr. *X* *Az Cz Pwcz Wgf*

Low-temperature crystal holder for the EG electron-diffraction camera

V. F. Dvoriankin, B. K. Vainshtein. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 507-509 (July-Aug) (Original in Russian)

3 illustr, 7 ref. *D* *Bc Psp Uklc Wcf*

Apparatus for microscopic investigation of the growth of crystals from solutions

M. I. Kozlovskii. *Soviet Phys, Crystallogr* 1958 Vol 3 (4) pp 513-515 (July-Aug) (Original in Russian)

2 illustr, 3 ref. *D* *Bz Ubz Wcm*

Mica as a material for vacuum technology III. Glimmer als Werkstoff der Hochvakuumtechnik III

W. Espe. *Vakuum-Tech* 1959 Vol 8 (3) pp 67-75 (Apr) ; abstr *Instrum Abstr* 1959 Vol 14 (7) p 245 (July) (Original in German)

This instalment deals with mica-glass or mica-metal seals and applications of mica as insulator, spacer, window and mosaic carrier in iconoscopes and supericoniscopes. The production of synthetic mica and its properties are discussed.

X *Bcz Cql/Bcz W.1452*

Spinel or standard refractometer. Spinell- oder Standard-Refraktometer

A. E. Farn. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (10) insert p III (Oct) (In German)

A *Wcd*

Roughness from spark machining. Rugosités d'étincelage

l'Abbé Cayère. *Mach Mod* 1959 Vol 53 (608) pp 25-31 (Nov) (In French)

A special sapphire point was sharpened to form a stylus for testing the surface finish of spark-machined parts. As the grooves are unlike the groves normally made by cutting tools the problem was complex and delicate and much experiment was required. 19 illustr.

A *Az Ceqm Cx Tdb*

DAS 1,058,750 **R. E. Reason, Taylor, Taylor & Hobson Ltd**

(June 17, 1957—conv date, Gt Britain)

Device for indicating or measuring the unevenness, ie roughness or waviness respectively, of a surface. Vorrichtung zum Anzeigen oder Messen der Unebenheiten bzw Rauhigkeiten oder Wellungen einer Flaeche

This refers to the support of the stylus and the detector which should ensure the same sensitivity at all points of the surface. At least one clutch is inserted in the connections between stylus and detector and measuring head which, when disengaged, does not transfer the movements of the stylus to the detector. It is important for the first large movements of the stylus, when its position is to be adjusted, to cause correct contact at the right pressure on the surface under test. The clutch is preferably electro-magnetically controlled. (14 claims, 12 illustr).

J *Cx Wgf.545*

HARDNESS AND WEAR TESTING

Current hardness tests for formed aluminium and aluminium alloys semi-products

M. Brzovohaty. *Hutn List* 1959 Vol 14 (9) pp 768-774 (Sep) (In Czech)

For the measuring of hardness of Al and Al-alloys semi-products the Czechoslovak standard for Brinell hardness recommends the load degree $P = 5.0^3$. This load degree does not include the whole hardness range occurring with these materials. Besides this the resulting values of Brinell hardness vary in dependence on the diameter of the used ball, causing error. Vickers tests are more reliable. Agreement of Brinell and Vickers occurs only for load degree $P = 10.0^2$ and for balls of 5 mm and 10 mm diameter. From the relation between them it is possible to find the tension strength. Although it was found possible to express the strength-hardness ratio with equations, exact results can only be achieved if the type and condition of alloy are taken into account. 13 illustr, 15 ref, 2 tables.

A *Bfg Cv/Bfxc Cv*

Surface specifications . . . their use and meaning

C. H. Good. *Tool Engr* 1959 Vol 43 (4) pp 77-80 (Oct)

Some degree of surface irregularity is inevitable and often desirable. The extent to which finish is controlled depends largely on an understanding of surface specifications and their application. 5 illustr.

X *Unf Wp.21*

High temperature hardness

J. Pomey, A. Royez, J. P. Georges. *Rev Métall* 1959 Vol 56 (3) pp 215-228; abstr *Metallurg Abstr* 1959 Vol 26 (12) col 904 (Aug) (Original in French, abstr in English)

A modified Vickers diamond-pyramid hardness testing machine is used in atmospheres up to 100° C in thermal analysis for studying isothermal transformations as a function of time, and creep in relation to time of application of the load at constant temperature. It can also be used to study high-temperature behaviour of very small amounts of metals in a very short space of time. It is primarily intended for steels but its application to Cu-W sintered compacts and A-base alloys is illustrated.

A *Nde Wghc:Cz Vbb*

A bend test for hardened tool steels

Anon. *Instrum Pract* 1959 Vol 13 (11) p 1138 (Nov)

A method developed by BISRA of testing tool steels with hardnesses of over 800 v.p.n. A mechanized version of the apparatus is being designed.

D *Al Cvd*

These machines grind, scratch, gouge, to measure abrasive wear

D. Gardner. *Prod Engng* 1959 Vol 30 (46) pp 70-73 (Nov 9)

Abrasion resistance cannot be predicted from known properties of a material. Even testing is unreliable unless test conditions are closely related to actual conditions the material will meet in service. A group of machines that simulate such conditions and give comparative data quickly and inexpensively is described here. 7 illustr.

D *Wgm*

Accurate shop testing of diamond wheels

J. W. Ripple (Carborundum Co). *Grinding & Finishing* 1959 Vol 5 (7) p 46 (Nov)

Most of the testing methods developed are inadequate. Weighing and measuring to establish a ratio of wheel wear requires laboratory conditions. A small error of measurement in the short test can lead to a large variation in actual results under normal shop conditions. The torque tests are described as completely undependable. However, a test method is proposed which is believed to be adaptable to conditions in most shops, including those with a wide variety of non-repetitive work. If a shop has a large number of one type of tool coming through regularly, all wheels can be tested on that tool only. Once a standard number of tools per wheel has been established, test wheels can be run against the standard. For the test three wheels are needed; the two to be compared must be new, the third need not be. The testing procedure is described. Advantages are that a minimum of records are required, the wheel measurements at the start and end of the test being the only necessary data; both wheels are treated equally, so that the question of which did more work does not arise. Disadvantages include the need for three wheels, where one would normally be used; considerable time is involved; the test is less practical for large wheels; and it is strictly a wheel-to-wheel test, based on current conditions. However, properly understood and repeated at suitable intervals, the test should be more satisfactory than most now in use.

D *Cz Nv*

Relative hardness and degree of maturity as conceptions for evaluating grey cast iron

W. Patterson. *Giesserei* 1958 Vol 45 pp 385-387 (July 3); abstr *J Iron & Steel Inst* 1959 Vol 192 (3) p 315 (July) (Original in German, abstr in English)

A *Bfca Unh*

A contribution to the practical application of the micro-hardness testing apparatus. Ein Beitrag zur praktischen Anwendung des Mikrohaertepruefers

L. Willing. *Radex Rdsch* 1958 (6) pp 313-316 (Sep); abstr *J Iron & Steel Inst* 1959 Vol 192 (3) p 315 (July) (Original in German, abstr in English)

A definition is given of the concepts of load-dependent and load-independent micro-hardness; a development of the nomogram for the determination of micro-hardness is described which permits reading-off of the Meyer index. Some comments are made on the operation of the Reichert micro-hardness testing apparatus. *A* *Unhd.21/Wghd*

Microhardness, microstability, and stability toward static and impact bending of thermally treated glasses

A. I. Berezhnoi. *Izvest Vysshikh Ucheb Zavedenii, Khim i Khim Tekhnol* 1959 Vol 2 (1) pp 82088; abstr *Chem Abstr* 1959 Vol 53 (16) col 15510 (Aug 25)

A *Bmz Um/Bmz Unhd*

Direct stress machine for combined fatigue and creep testing

A. H. Meleka (Brit Iron & Steel Res Ass). *J sci Instrum* 1959 Vol 36 (11) pp 468-471 (Nov)

6 illustr. *D* *Cz Unk/Cz Uns*

A better instrument to measure tool wear

I. Ham, J. Stanislao. *Amer Mach* 1959 Vol 103 (23) pp 107-108 (Nov 2)

A modified Brinell microscope to observe and measure tool wear without removing the cutting tool from the test lathe. 8 illustr. *D* *Pd Unr V Wcm*

Microhardness, its importance and measuring

J. Shon. *Strojirenstvi* 1959 Vol 9 (6) pp 453-460 (June); *Battelle Techn Rev—Abstr* 1959 Vol 8 (10) p 590a (Oct) (No 11905) (Original in Czech)

X *Unhd*

The measurement of hardness: principles, conceptions and methods. Haertemessung: Grundlagen, Begriffe und Methoden

A. Braun. *Schweiz Arch angew Wiss* 1958 Vol 24 (4) pp 106-133; abstr *J Iron & Steel Inst* 1959 Vol 192 (3) p 315 (July) (Original in German, abstr in English)

A *Unh V*

Does compensation of thermoelectric currents influence cutting tool wear?

G. Engstrand. *K tekn Hogsk Handl* 1959 (144) 11 pp (In English)

In machining with sintered carbide tools the oxidation phenomenon is a contributive cause to the wear of the cutting edge. In this report an account is given of the influence of compensating thermocurrents on the wear process. 6 illustr, 3 ref, 1 table.

D *Pd Unr*

Use of radioactive isotopes for measurement of cutting tool wear

G. Engstrand. *K tekn Hogsk Handl* 1959 (143) 18 pp (In English)

The thesis deals with methods and applications of the isotope technics in determination of wear resistance of cutting tools. Relative measurements have been performed by means of a scintillation detector. 12 illustr, 1 table. *X* *Pd Unr V:Syb*

Present-day technique in hardness problems

Anon. *Techn Industr* 1958 Vol 36 pp 645-648 (June); abstr *J Iron & Steel Inst* 1959 Vol 192 (3) p 315 (July)

A short description of various types of hardness testing instruments. *A* *Wgh*

Hardness tester

E. G. Herbert Ltd, Atlas Works, Levenshulme, Manchester 19. *Engng* 1959 Vol 188 (4871) p 85 (Aug 28)

The Olsen Air-O-Brinell hardness testing machine uses compressed air to apply the load. Accurately regulated air pressure is applied by a diaphragm to the ram which carries a hardened steel ball that in turn applies the selected Brinell load to the specimen. 1 illustr.

A *Wghc*

TRUING OF GRINDING WHEELS

One pass grinds Cadillac wheel spindles

Cadillac Motor Car, Detroit. *Amer Mach* 1959 Vol 103 (23) p 103 (Nov 2)

Diamond truing is said to be responsible for the accuracy and surface finish attained when grinding three spindle diameters in one operation with a special angled wheel. The truer has three faces fitted with five diamonds each, all mounted in a straight line on each face, since multiple diamonds produce an open wheel face and a greater number of workpieces per truing than a single-point truer. The tool can be used upside down after three sets of stones have dulled, thus providing six positions. 3 illustr. *D* *Njd Psf*

Wheel forming attachment

Pratt & Whitney Co Inc, West Hartford 1, Conn. *Tool Engr* 1959 Vol 43 (5) p 164 (Nov)

Model No 5 grinding wheel forming attachment for surface grinders, is designed for permanent mounting on the spindle head, and has a swivelling tandem type diamond spindle with one diamond for semi-finishing and another for finish truing. A tracer traverses the profile of the template and the path of the tracer is transmitted to the truing diamond. 1 illustr.

D *Ab Cg Njc Psf:Chc Pr*

Grinding wheel dressers

Precision Diamond Tool Co, Elgin, Ill. *Tool Engr* 1959 Vol 43 (5) p 150 (Nov)

Small elongated diamonds are mounted in a steel matrix in such a way that the tool is kept sharp and the same contact area of diamond is presented to the grinding wheel throughout the life of the truer, it is claimed. Thus grinding efficiency is increased by lowering grinding heat.

D *Ab Cg Njd*

Radius turning attachment takes 3½ in. diameters

Wade Tool Co, 49 River St, Waltham, Mass. *Steel* 1959 Vol 145 (16) p 176 (Oct 19)

The attachment machines concave or convex surfaces on the axis of a lathe with a single-point turning tool. The tool bit is set directly to the desired radius with a dial indicator which reads in thousands. Feed is controlled by a worm gear. The attachment can be adapted to a variety of lathes. 1 illustr.

A *Az Ceqb Pdz*

Grinding wheel dresser offered for heavy-duty jobs

L. Newman, 1001 24th St, Oakland 7, Calif. *Amer Mach* 1959 Vol 103 (24) pp 202, 204 (Nov 16)

Model 10 is made of high tensile strength cast aluminium alloy. Specially developed cutters and abrasive wheels are interchangeable. Built-in tangential angle of the cutters, or wheels, eliminates need for a breaking device and assures sharp, cool grinding, it is claimed. This model will fit standard Peterson cylinder head and Lempco grinders. 1 illustr.

D *Psfz*

Why wheel balancing ?

E. J. Kaiser (Aero Supply Mfg Co Inc). *Grinding & Finishing* 1959 Vol 5 (7) pp 38-40 (Nov)

Balancing of grinding wheels is too often considered necessary only when high precision work is being done, but the attempt to correct imbalance by truing wastes a great deal of abrasive and does not remove the basic fault. For this reason, grinding machine manufacturers have provided a groove and movable balance weights to fit in the groove, in the wheel flange or hub. One maker has developed an automatic balancer as an integral part of the machine.

Tests have shown that a balanced wheel grinds about 50% more pieces satisfactorily between truings, thus saving time as well. The differences between static and dynamic balancing are described, and advice given on operating practice. 2 illustr.

D *Cgz Nv*

Double wheel honing machine

Payne Products International Ltd, Hounslow, Middx. *Tooling* 1959 Vol 13 (12) p 90 (Dec)

A double wheel honing machine made by Armstrong (Leeds) Ltd carries honing wheels 36 in. diameter and is suitable for flat or cylindrical parts. The wheels are trued by a hydraulically operated diamond truer. 1 illustr. *D* *Chh Pr:Nj Psfb*

BP 816,159 (Feb 12, 1957) **A. Nagy**

Diamond tipped tools

In the usual arrangement of the mechanism for indexing a truing diamond, access is frequently obstructed by machine parts adjacent the wheel to be trued. This disadvantage is eliminated by the arrangement shown in Fig 1. The indexing mechanism for diamond 12, consisting of ratchet member 15 and detent 40 with chisel shaped end 41 under pressure of spring 44, is operated from the remote rear end 33 of shank 34 through joint 35, 46 permitting angular movement between shank 34 and truing tool rod 37.

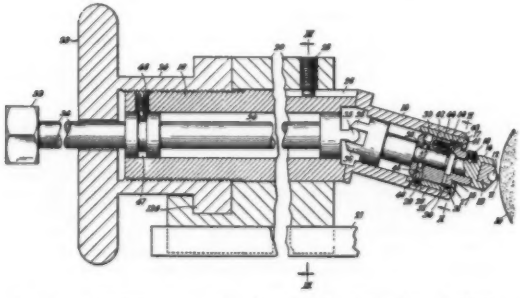


Fig 1. Arrangement of the mechanism for indexing truing diamond 12 without obstruction from adjacent machine parts. BP 816,159.

The micro-feed of diamond 12 by hand wheel 23 is independent of the indexing movement after adjustment of housing 20 along slide 21 by a lead screw (not shown in Fig 1). (9 claims, 4 illustr). Ref: BP 777,257 (orientation of diamond).

J *Ab Cg Nj.545*

BP 816,646 (Oct 11, 1957) **R. Allen, Engineering Diamonds Ltd**

Dressing tools

The chisel-type truing diamond is often inaccurately positioned and this may result in inaccuracies in the diamond tip which may lead in turn to lateral stresses

Fig 2. Diamond of a shape suitable for easy positioning. Cutting edge 17 is strengthened by sloping edges. BP 816,646.

in the cutting edge. The correct position is difficult to assess. A diamond of the shape shown in Fig 2 is more easily positioned and its cutting edge 17 is stronger because of the sloping edges 15. (6 claims, 6 illustr).

J *Nj.545*

USP 2,888,005 (July 13, 1953) **R. E. Goeke, J. A. Corriveau, K. E. Sihvonen, H. A. Metz**

Holder for a diamond dressing tool

Controlled rotation of the truing diamond before each pass of the tool across a grinding wheel face is electrically produced by a switch-operated solenoid circuit. The energized solenoid 46 in Fig 4 turns disk 54 about 45°, the disk being returned by spring 52. The eccentric pin 56 rotates shaft 58 and, through ratchet device 62 shaft 60, and hence through worm and worm wheel 64 and 66 (shown also in Fig 5) diamond 36.

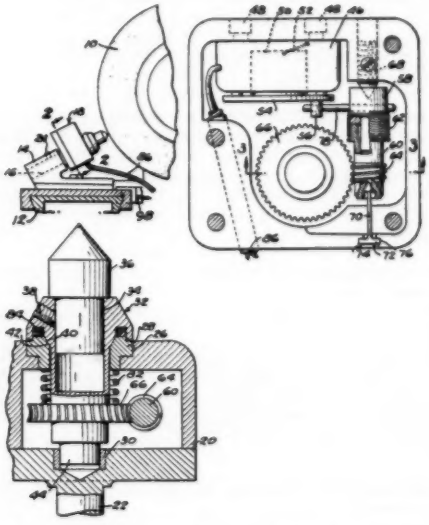


Fig 3 (top left). General view of truing and wheel 10.
Fig 4 (top right) and 5. Diagrams showing operation of solenoid circuit. USP 2,888,005.

Fig 3 is a view illustrating the general arrangement of the truing tool in contact with wheel 10. The controlling switch 98 may be mounted on the tool slide to be automatically actuated each time the tool holder makes a pass across the wheel. (8 claims, 5 illustr). Ref cited : 12 USP ; 1 Austral P ; 1 FP.

J *Mf Nj.545*

PRECISION MACHINING OF METALS

From missiles to pots and pans . . . Floturning produces stronger, more accurate parts faster

D. Ward. *Mach Tool Blue Bk* 1959 (11) pp 105-110 (Nov)

A chipless machining process which is growing in favour combines sheet metal spinning and heavy metal extruding. Known as 'floturning' at Lodge & Shipley, it is done by squeezing or flowing thick metal over a revolving mandrel with high pressure rollers which are tracer controlled to follow the required contour. Stronger, more accurate parts can be produced faster by this method properly applied, it is claimed. One example is floturning 15 in. diameter aluminium drums up to 30 in. deep to close tolerance specifications. Finish is improved to better than 5 to 6 r.m.s. by taking a subsequent fine cut with a diamond tool while the part is still held on the arbor. 8 illustr.

D *Agz Bfg Ceqb Nf/Agz Bfg Cnz*

Here's a fast way to drill hard materials

P. A. Meline. *Mach Tool Blue Bk* 1959 (11) pp 122-126 (Nov)

Extensive tests on high temperature alloys showed the superiority of cold point drills, even leading to the claim that there is no impossible-to-drill material. The drill has a single hollow core through which a large volume of coolant is supplied under pressure to the cutting zone, which consists of a specially shaped carbide tip brazed into a slot milled in the tip. Design features are said to ensure that the point of the drill is being used so that it can penetrate faster and cut with thrust instead of torque; temperature of the drill point remains at room heat; a negative rake makes tiny chips, easy to flush out. Thus, it is claimed, deep hole drilling is no problem and extremely fine finishes are possible, so long as certain rules are observed. 3 illustr, 1 table.

D *Ba Cfb Plb Qs Sj*

Diamond tool lathe produces finishes from 3-5 micro-inches

Milo Mfg Co, Elizabeth, NJ. *Mach Tool Blue Bk* 1959 (11) pp 222-223 (Nov)

A precision diamond tool lathe, designed to turn super-finished, accurate surfaces, and to provide correct cylinder form and surface flatness, is used primarily for non-ferrous metal machine components for assembly with mating parts. Honing and lapping are eliminated, it is claimed. Diamond, ceramic or carbide tools can be used, and features include drip-feed lubrication and a four-way tool holder with indexing mechanism. 1 illustr.

D *Ceqbb Nf Pr/Ceqbb Pdc*

Douglas (Kingswood) Ltd

Anon. *Mach Tool Rev* 1959 Vol 47 (281) pp 107-112 (Sep-Oct)

Operations include diamond turning of 1.3744/1.3738 in. diameters on a brass relay piston to a 5 micro-in. finish, which has eliminated subsequent grinding and polishing. 11 illustr.

D *Agg Bfxg Ceqb Nf*

Lathe turns to high finish, cuts grinding, polishing

Monarch Machine Tool Co, Sidney, Ont. *Canad Mach* 1959 Vol 70 (11) p 96 (Nov)

Designed to finish turn rolls, cylinders, tubes and similar parts to a critical microinch finish at surface speeds above 2,000 sfpm, Series 62 Hy-Fin lathe is said to eliminate or drastically reduce grinding and polishing time. Taper is claimed held within 0.00025 in., concentricity to less than 0.0005 inch. 1 illustr.

D *Ag Ceqbb Unf*

Machining a Stellite-Inconel weld union

P. ten Imber. *Tooling* 1959 Vol 13 (12) p 43 (Dec)

Components consisting of an 8½ in. diameter Iconel wheel with Stellite vanes welded to the rim required a facing cut to clean the weld. The difficulty of taking an irregularly interrupted cut, and of dealing with such intractable materials, was met by using Carboloy grade 370 carbide tools, at a speed of only 56 rev/min, with a feed of 0.015 in./min, and a depth of cut approximately ⅛ inch.

D *Az Bfxz Ceq*

Tape positioning halves machining time

L. E. Batchelor. *Metalworking Prod* 1959 Vol 103 (48) pp 1923-1924 (Nov 27)

In addition to improving fixture use, numerical control on a drilling machine has cut manufacturing time more than 50% and has virtually eliminated scrap. Tool life is greatly extended too. 3 illustr.

X *Cfb Pr Wpz*

Titanium machining techniques

Titanium Metals Corp of America, 233 Broadway, New York 7. *Steel* 1959 Vol 145 (16) p 180 (Oct 19)

A 32-page manual may be obtained giving recommendations for successful turning, milling, drilling, tapping, grinding, and sawing of commercially pure and alloy grade titanium.

A *Bfn Ceq.523*

Cut-off saw slices steel without clamping

Production Machinery Inc, Box 322, Oakton Station, Des Plaines, Ill. *Steel* 1959 Vol 145 (6) p 147 (Aug 10)

The Promacut unit has a special alloy saw blade and a special angle for cutting, which produce a semi-milling operation instead of abrasive or scraping action. Thus a smooth, burr-free cut is obtained without drag. 1 illustr.

A *Bf Ceg Pc*

Profile cutting

British Oxygen Gases Ltd, Ferranti Ltd. *Iron & Steel* 1959 Vol 32 (7) p 351 (June)

A computer-controlled profile cutting machine has been developed, which is a major advance in the direction of complete automation and also achieves important savings in the cost of production.

A *Ceqg Prs*

Drilling the holes that provide fuel for outer-space propulsion

C. O. Herb. *Machinery, NY* 1959 Vol 66 (3) pp 125-127 (Nov)

Describes four machines which drilled hundreds of thousands of minute holes in injector heads. Injector parts were made from such materials as SAE 4130 chromium-molybdenum steel, stainless steels, copper, and aluminium alloys. Standard drill points used were precision sharpened. 4 illustr.

D *Az Bf Cfb Pr*

Machining a new high tensile steel alloy—a case history

B. West. *Mod Mach Shop* 1959 Vol 32 (6) pp 132-134 (Nov)

A new high tensile alloy, Hy Tuf steel, was successfully machined, after normalizing and deep drawing, by methods similar to those for machining 4130 and 4340 molybdenum steels. HSS and carbide-tipped tools were used, and machine power requirements resembled those of other high tensile materials. 1 illustr.

D *Bfxf Unlc:Ceq*

Europe ' roughs up ' ceramics

J. L. Guedeu (C. E. Reuss). *Tooling & Prod* 1959 Vol 25 (8) pp 37-39 (Nov)

Reports on European use of ceramic and oxide tools for such operations as cast iron turning, steel turning, and milling. 2 illustr.

D *Bfca Ceqb Pdd/Bfd Ceqb Pdd/Cff Pdd*

Tool geometry and machine settings for turning titanium

Titanium Metals Corp, New York. *Titanium Engng Bull* No 7; *Tool Engr* 1959 Vol 43 (5) pp 119-122 (Nov)

15 tables. *D* *Bfn Ceqb Pd.21*

Improved cutting tool for stainless steel

Spring Garden Inst, Philadelphia. *Tool Engr* 1959 Vol 43 (5) pp 144-145 (Nov)

A milling cutter of copper-impregnated powdered iron with locked-in carbide and ceramics has been developed to cut stainless steel alloys which harden as cutting pressure is applied. Tool life is said to be twelve times that of other cutters. *D* *Bfdb Cff Pd*

Using ceramic-tipped single-point tools

Various. *Mass Prod* 1959 Vol 35 p 116; *Brit ceram Abstr* 1959 (9) p 310A (Sep)

Compares work-surface finish and tool life when turning alloy steels with ' clamped-on ' ceramic and carbide tips.

D *Bfd Ceqb Pdcb/Bfd Ceqb Pddb*

Zagar machine equipped to process brake-wheel cylinder

Zagar Inc, Cleveland, Ohio. *Machinery, NY* 1959 Vol 66 (3) pp 187-188 (Nov)

Thirteen different jobs, all with different hole patterns, are drilled, counter-sunk, reamed, and tapped with the same four heads on a machine announced by Zagar Inc. 1 illustr. *D* *Agz Ceq*

How to reduce costs by using ceramics. Comment réduire les prix par l'emploi des ' céramiques '

B. E. Storrs. *Mach Mod* 1959 Vol 53 (608) pp 32-34 (Nov) (In French)

6 illustr, 1 table. *A* *Pdd.145*

Machining components for missile guidance systems

D. G. Gill, C. D. Spainhour. *Machinery, Lond* 1959 Vol 95 (2455) pp 1152-1160 (Dec 2)

Describes drilling, tapping, counterboring, and reaming of some 250,000 holes monthly at Western Electric Co Inc, and gives examples of tooling and techniques in the precision gear shop. 15 illustr.

D *Ad Ceqz*

Which rake angle for carbide inserts ?

H. Frommelt. *Metalworking Prod* 1959 Vol 103 (45) pp 1778-1779 (Nov 6)

Positive rake tools sometimes cut better, and cutting materials now in vogue allow positive rake even when cutting 105-ton alloy steels. But positive rake angles also mean fewer cutting edges per insert, and often the economics can make negative rakes more practical, even when positive rakes will work. 2 illustr, 1 table.

X *Alz Bkc Chcb*

Honeycomb cores

Anon. *Carbide Engng* 1959 Vol 11 (10) pp 21, 23 (Oct)

Circular milling cutters for machining stainless steel honeycomb core are of the replaceable ring type and are designed to allow maximum resharpening of the solid carbide ring before replacement. 3 illustr.

D *Az Bfdb Cff Pdcb*

The production of telecommunications equipment

Ericsson Telephones Ltd. *Machinery, Lond* 1959 Vol 95 (2452) pp 964-974 (Nov 11)

Describes machines used in the jig boring and grinding sections. 18 illustr.

D *Az Cfbz/Az Chc*

Longer life claimed for double-angle drill point

Anon. *Machinery, NY* 1959 Vol 66 (3) p 148 (Nov)

Drills with a double-angle point and notched web are being used in Russia. Two to three times greater tool-life when drilling steel, four to six times when drilling cast iron, less feeding pressure, lower power consumption and heat-generation, are advantages claimed. Dimensions for various-size drills are given. 1 illustr, 1 table. *D* *Pl Uqe*

Use of allenite A.S. grade tools as boring tools

Anon. *Edgar Allen News* 1959 Vol 38 (446) p 185 (Aug)

Reader's question.

Trouble was experienced with Allenite AS grade tools which cracked when the approach angles and chip breakers were being ground. To find the cause of trouble a diamond wheel was dressed and a further tool ground, spalling being removed with the diamond wheel. It was discovered that too large a wheel was being used for putting in the chip breaker, producing a negative top rake when the chip breaker was on the tool. *A* *Al Cm Nv*

Ceramic tools : let them work where other materials fail

H. Frommelt. *Iron Age* 1959 Vol 184 (16) pp 106-108 (Oct 15)

2 illustr, 3 tables. *A* *Pdd*

Get the most from cutting tools

R. H. Eshelman. *Iron Age* 1959 Vol 184 (15) p 91 (Oct 8)

A *Pd*

Ingenious tooling produces typewriter parts, Part 2

Underwood Business Machines Ltd. *Metalworking Prod* 1959 Vol 103 (47) pp 1863-1868 (Nov 20)

Describes equipment used for combined air drilling, automatic drilling, annular broaching, and various milling operations. 10 illustr.

D *Az Cfb/Az Cff/Az Cfm*

Gun drilling set-up gives 74% output rise

Mallory Electric Corp, Detroit. *Metalworking Prod* 1959 Vol 103 (47) p 1874 (Nov 20)

Gun drilling proved better than twist drilling when long, small diameter holes with smooth, accurate finish were required. Gun drills of HSS with carbide cutting heads and tips produced surface finish close to 15 micro-inches. 3 illustr. *D* *Cfbn Pl*

High speed milling for hard metals

Boeing Airplane Co, Seattle, Washington. *Metal Ind, Lond* 1959 Vol 95 (16) pp 344-345 (Nov 27)

A new milling process for trimming Armco PH 15-7 Mo stainless steel is said to combine the high speeds of routing with the mechanical feeds, cutting pressures and solid fixturing of standard milling practice, as well as climb cutting, carbide-brazed cutting tools and liquid carbon dioxide cooling on both cutter and point of machining. The process has potential applications for machining ultra-hard, thermal resistant metals, and is expected to increase production rates a hundredfold while increasing tool life. Tests continue. 1 illustr.

D *Bfd Ceq Pd Qs Skfz*

New sintered carbides for machining

J. Chmelik. *Strojirenska Vyroba* 1959 Vol 7 (5) pp 191-195 (May); *Battelle Tech Rev—Abstr* 1959 Vol 8 (10) pp 591a-592a (Oct) (No 11926) (Original in Czech)

Results concerning cutting depth, cutting speed, tool life, *etc*, achieved when machining with new kinds of sintered carbides having such compositions as WC-TiC-TaC-Co and WC-TiC-TaC-Cr_3C_2-Co.

X *Ceq Pdc Uq*

Carbide and ceramic tools : an economic comparison

P. T. Fitzroy. *Aust Fact* 1959 pp 71-72 (Aug 1); *PERA Bull* 1959 Vol 12 (11) p 329 (Nov)

Describes machining tests to determine variation of tool life with cutting speed for the two tool materials.

X *Pdc Uq.1312*Pdd Up.1312*

Semiautomatic gun drill

Griscom-Russell Co, Massillon, Ohio. *Mech Engng, NY* 1959 Vol 81 (10) p 85 (Oct)

1 illustr. *M* *Cfbn Prsb*

Calculation of curves for automatic precision centre lathes for turning parts used in precision engineering. Berechnung von Automatenkurven fuer Praezisions-Langdrehautomaten zur Herstellung von Drehteilen der Feinwerktechnik

J. Lux. *Feinmechanik u Optik* (Monatsschr) 1959 Vol 79 (11) pp 331-334, 342 (Nov) (In German)

6 illustr. *A* *Az Ceqb.21*

Metal turning with the help of ceramic cutting material

D. A. de Fremery. *Metalen* 1959 Vol 30 (12) pp 182-185 (June); *Battelle Techn Rev—Abstr* 1959 Vol 8 (10) p 591a (Oct) (No 11917) (Original in Dutch)

X *Bf Ceqb Pdd*

An experimental investigation of vibration milling

H. E. Rose, R. M. E. Sullivan (King's College, London). *Brit Chem Engng* 1959 Vol 4 (8-9) pp 450-457 (Aug-Sep); *Metal Powd Rep* 1959 Vol 14 (2) p 19 (Oct)

D *Cffc.1312*

Ceramic tools

Anon. *Tooling* 1959 Vol 13 (12) p 39 (Dec)

Developments in this country and in America and Russia indicate that ceramic tools may have a clear economic advantage over tungsten carbide for machining a wide range of materials, both ferrous and non-ferrous. Although such tools have been used on a production basis to machine, for example, gun metal, aluminium, high tensile steel and even case hardened steel, much more development work is needed. Chip control is one problem; another is using ceramic tools for interrupted cutting.

D *Bf Ceg Pdd.132*

Modern 'scalers' with sintered carbide tools. Moderne 'pelatrici' con utensili in metallo duro

W. Vogel. *Macchine* 1959 Vol 14 (11) pp 1078-1080 (Nov) (In Italian)

Sintered carbide tools have replaced HSS tools and give better finish and closer tolerances. 3 illustr.

M *Cz Pdc*

REQUESTS FROM AMERICA

American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.

FP 1,180,655 E. M. Weaver, B. C. Hawthorne, (Apr 10, 1956—conv date, USA) J. L. Stockard

Cutting edges for drill rods and drill rod provided with such cutting edges. Lame pour tarière de forage et tarière munie de ces lames

Higher cutting efficiency is claimed for a drill, as shown in Figs 6 and 7. The cutting edges 24, 26, 28, 30 are stepped and arranged in a certain relationship so that an interior pilot drill effect is obtained. The pilot

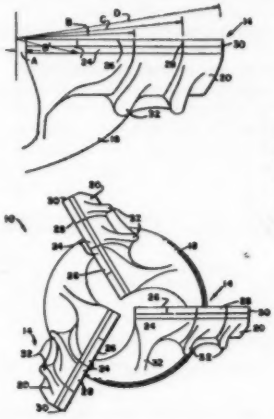


Fig 6 (below) and 7. Two views of the drill, showing cutting edges 24, 26, 28, 30 stepped and arranged to obtain an interior pilot drill effect. FP 1,180,655.

cutting edge has a radius of one half of the total diameter of the drill but double the length of the stepped higher edges as seen at B, E and D of Fig 6 and 7, B being the radius of the pilot edge. Wear of the edges does not affect the area of contact so that the drill in a way re-sharpens itself. As material for the cutting edges tungsten carbide is recommended. (21 claims, 28 illustr). *J* *Cfd Pdcb.545*

CUTTING & MACHINING OF STONE, ETC

Machining of porcelain insulators : II, Cutting off with grinding wheels in the wet state

K. Funahashi, S. Sakai, K. Yamada. *Nagoya Kogyo Gijutsu Shikensho Hokoku* 1958 Vol 7 (5) pp 81-84; *Amer ceram Abstr* 1959 Vol 42 (11) p 279 (Nov) (Original in Japanese)

The dry grinding of porcelain insulators is accompanied by an enormous amount of dust. Experiments were made with wet grinding, and the results were compared with those of dry grinding. Dust is eliminated, but the grinding force required is much higher than in the dry state. Wear of the grinding wheel is much greater, and the machine becomes rusty due to the grinding liquid. The efficiency is inferior to that of dry grinding.

See also *Amer ceram Abstr* 1959 Vol 42 (10) p 263 (Oct); abstr *Industr Diam Abstr* 1959 Vol 16 p A237 (Dec). *X* *Az Blb Chc*

News of the industry

Newage Machine Tools Ltd, 98-100 Croydon Rd, SE 20. *Machinery, Lond* 1959 Vol 95 (2452) p 1015 (Nov 11)

A machine for slicing radioactive materials has a diamond impregnated cutting-off disk.

D *Bz Cej Nt Pr*

Strength and static fatigue of abraded glass under controlled ambient conditions : I, General concepts and apparatus

R. E. Mould, R. D. Southwick. *Amer ceram Soc J* 1959 Vol 42 (11) pp 542-547 (Nov)

Preliminary studies were carried out in which hand abrasion with emery cloth, diamond scratching, glass-to-glass contact, and grit blasting were compared as means for producing reproducible specimens for strength studies. Grit blasting, if carefully controlled, yielded the best results. 6 illustr, 9 ref.

D *Bm Chmz Unl/Bm Chmz Uns*

Ceramics in the metallurgical and electrical industries

R. N. P. Arogyaswamy. *Indian Min* 1958 Vol 12 (1) p 26 ; *Brit Ceram Abstr* 1959 (10) p 339A (Oct)

A short general survey (with map) of Indian resources of raw materials for the ceramic industry is followed by general notes on the types of ceramic product being made. *X* *Bl.25.371*

Mica processor employs fluid energy to grind, classify to 8 fine sizes

H. F. Utley. *Pit & Quarry* (Chicago) 1959 Vol 51 pp 86-87 (June) ; *IMM Abstr* 1959 Vol 10 (1) p 34 (Oct-Nov)

D *Bcz Chc Pr*

Mineral dressing laboratory

General Electric Co Ltd. *Metal Ind, Lond* 1959 Vol 95 (14) pp 305-306 (Nov 13)

Describes functions of such a laboratory and equipment used, including grinders. 3 illustr.

D *Bc Chc.264*

Automatic machining operations on graphite blocks

A. Reyrolle & Co Ltd. *Machinery, Lond* 1959 Vol 95 (2453) pp 1048-1052 (Nov 18)

8 illustr. *D* *Az Bhb Ceq*

USP 2,885,832 (July 20, 1956) **J. A. Briggs, Radio Corp of America**

Art of forming surfaces of peculiar contours

Aspheric asymmetric lenses are used in the light box or 'lighthouse' for obtaining dot-like (or line-like) mosaic patterns of colour-phosphors on the screen-plate of a color-kinescope. These and similar peculiar lens contours have no axis of symmetry, though sometimes a line of symmetry in the plane of the lens, and cannot be formed on an ordinary lens grinder. The special apparatus for generating these lenses is provided with a turntable mounted to permit continuously variable cam-controlled tilting movements about at least one axis normal to the axis of rotation of the turntable, while the cutting (grinding) tool carriage is mounted to permit undulatory cam-controlled movement along a radius of the workpiece in predetermined relationship to the tilting movements of the turntable. Hard blanks (glass, ceramic, metal) may require diamond powder and a coolant for the grinding operation : appropriate means are provided for feeding and removing such cutting materials. (7 claims, 4 illustr). Ref cited : 2 USP. *J* *Bm Chch Tfb:Pr.545*

USP 2,886,026 (Aug 20, 1957) **R. F. Stewart, Texas Instruments Inc**

Method of and apparatus for cutting a semiconductor crystal

Cutting of crystals has been carried out, up to now, by means of diamond-studded circular saws producing a straight line cut. This is unsatisfactory for crystals characterized by a curved or non-linear junction. Making the path of the cutting tool dependent on the curvature of the junction offers a solution to the problem. In very thin specimens only the curvature in a horizontal plane need be considered. The solution makes use of a resistivity measurement on the surface of the crystal. Due to the reflecting nature of the junction, the resistivity measurement will produce a signal mathematically related to the distance of the measuring device from the junction. The signal is fed to a servo follow-up system that controls a cutting tool guiding it along a path parallel to the junction. The cutting tool may be a wire over which flows an electrolyte, *ie* working by an electrolytic etch cutting technique. However, any suitable tool can be used, *eg* a small saw blade or a small cavitron tool. (6 claims, 3 illustr). See : Handbook of Semi-conductor Electronics, 1956 (for resistivity measurement).

J *Bde Ceg Pr.545/Bde Ceg.21.545*

USP 2,886,923 (Jan 18, 1957) **C. H. La France, American Optical Co**

Lens surfacing techniques

A replaceable facing of a thin wire mesh, contoured to overlie the effective surface of a lens surfacing tool, is used instead of the customary grooved precision-formed cast iron surface, which needs truing after three or four grinding operations to be eventually replaced by a new expensive cast iron tool. The wire mesh consists preferably of 30 × 30 strands per inch with a wire size of 0.007 inch. The wire mesh is attached to the tool surface by a thin sprayed-on layer of water-proof adhesive and immediately flocked with a synthetic or natural fibrous material by blowing on lengths of not more than 1/16 in. of such material. After setting, an overall plush coating is obtained and on applying a second adhesive layer and pressure the wire mesh assembly will assume accurately the curvature of the tool surface. The abrasive slurry will be evenly distributed to all parts of the mesh and no "burned spots" will occur. (10 claims, 7 illustr). Ref cited : 5 USP. *J* *Bm Ceq Tfb:Pd.545*

GEM POLISHING

Fancy cuts

E. Sirakian. *Diamant* 1959 Vol 3 (16) pp 15-16 (Oct-Nov) (In French, Flemish and English)

Describes changing demand for different diamond cuts.

D *F Hl Kb*

IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

ROCK DRILLING

Monograph of the drilling section of the Commissariat a l'Energie Atomique. Monographie de la section sondages due Commissariat a l'Energie Atomique

R. Scatena. *Rev Industr min* 1959 Vol 41 (10) pp 856-880 (Oct) (In French, abstr in English)

A detailed review of equipment and methods includes a section on diamond tools. Special supply contracts are made with four different firms and care is taken over salvaging worn stones and tools. Records are kept of every detail of a tool from the moment it enters the store rooms. The majority of diamonds used are of Congo 'fermé' type, as close as possible to a sphere in shape, and weighing roughly 15 to 30 stones to the carat. These are used in preference to West African stones because their round shape does not allow them to be broken so easily. Here the ground to be drilled is of a type which tends to tear the stone away from its matrix (dechausser). A bond of very fine grain structure with less bond, *ie* usually tungsten carbide, is used with the stones deeply embedded, while when drilling soil which polishes the drill crown, a matrix with a coarser grain and more bond is used with the stones set so as to protrude more. The action of the soil being drilled depends on the type of core and the diameter used.

In heterogeneous and strongly silicified ground, drills with diamond-impregnated or sintered diamond crowns are used instead of those with inset diamonds. These avoid the likelihood of broken diamonds resulting from shock, and have the advantage of continually presenting fresh particles at the cutting edge, thus giving a constant rate of advance even in pure silicon. 6 illustr, 6 tables.

A *Bn Cfb Nh.213/F Hw Nh.213*

Geology and exploration of the Cape York peninsula bauxite deposits

H. J. Evans. *Chem Engng Min Rev* 1959 Vol 51 (11) pp 48-56 (Aug 15)

The report includes a description of the drilling equipment used. Owing to the predominately loose and pisolitic character of the bauxite to be mined, standard diamond drilling methods could not be used and accurate and rapid sampling of the laterite required the development of special methods and modifications of standard drilling equipment. Because the pisolites were to be screened and therefore had not to be crushed during drilling, standard percussion drilling was out of the question and recovery of loose pisolites with a standard diamond core barrel was almost impossible. Test drilling by hand with post hole diggers and augers was successful. Initially 3 and 4 in. standard drilling augers were adapted for use with normal diamond drill rods and standard diamond drilling rigs were used as a power unit. But when samples were withdrawn from the hole, loose pisolites tended to drop from the auger spiral. Finally, a combination of a slow drilling hand post hole digger and a fast drilling spiral auger, with a new type of auger, was adopted. The auger was of 6 in. diameter. 6 illustr, 1 table.

A *Bcz Cfb Nh.12.38*

Cartier Quebec proceeds with Mattagami drilling

Anon. *Canad Min J* 1959 Vol 80 (9) p 171 (Sep)

After completion of a magnetic survey, diamond drilling is proceeding on Cartier Quebec Explorations' Mattagami area property. A magnetic belt was found to cross the property, with magnetic green stones and basic instrusive dikes affected by cross faults and musses of acid intrusives.

A *Cfb Nh.343*

What the Russians have new in drilling

Members of All-Union Scientific Research Institute of Drilling Technique, Moscow, and USSR Academy of Sciences, Moscow. *Oil & Gas J* 1959 Vol 57 (38) pp 116-120 (Sep 14)

Included amongst new Russian developments and ideas in drilling are bits with unloaded bearings, drilling three wells simultaneously with a single rig, an electric downhole motor, and drilling with bottom-hole explosions. Regarding diamond bits for turbo-drilling, it was found that these bits do give large meterage per bit, but faster drilling progress cannot be obtained in deep wells if penetration rates are low. An increase in circumferential velocity up to 20 m/sec does not affect diamond bit wear resistance. Turbo-drilling with diamond bits is especially promising in slim-hole drilling where the development of long-wearing, small-size core bits is the most complex problem. 9 illustr.

A *Cfb Nh.132.33*

Development in rock tunnelling

Anon. *Iron Coal Tr Rev* 1959 Vol 179 (4755) p 232 (Sep 4)

An abridged version of a paper given by Mr L. H. Dickerson. Recent developments in rock tunnelling are reviewed and the technique adopted in the works of the North of Scotland Hydro-electric Board are outlined.

A *Bn Cfbz*

Percussion tool lengthens life, speeds penetration rate

Anon. *Drilling* 1959 Vol 20 p 90 (June); *Battelle Techn Rev—Abstr* 1959 Vol 8 (10) p 579a (Oct) (No 11643)

This new air or gas rotary percussion drilling tool achieves both faster penetration rates and longer bit life than conventional oil and gas drilling methods. Penetration rates range from two to five times the rates established by conventional rotary air drilling, and with up to four times longer bit life.

X *Cfbf Plb Uqe/Cfbf Plb Uqg*

Geologist's interpretation of drilling mud requirements, I

H. M. Johnson (Tulane Univ, New Orleans). *World Oil* 1959 Vol 149 (6) pp 133-136 (Nov)

Electric logs and oil finding techniques will vary with different types of mud systems. 4 illustr. (To be cont).

D *Sjb*

Cast diamond core drill bits

M. Proner. *Hutn List* 1959 Vol 14 (7) pp 588-593 (July) (In Czech)

Various possible methods exist for casting diamond drill bits and the one chosen as most efficient was a suitably adjusted vacuum casting with stone sticking by means of water glass [sic]. Tests were performed to give data concerning the Vickers hardness in relation to temperature. Aluminium bronze requiring no heat treatment was found more advantageous than a Cu-Ni-Si-alloy. 8 illustr, 5 ref, 2 tables.

A *Nhb Unhcc*

DIAMOND TECHNOLOGY

First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

Drill pipe and tool joints, drill collars, rock bits, diamond core and drill bits

Anon. *Drilling* 1959 Vol 20 (8) pp 67-75 (June); abstr *J Inst Petrol* 1959 Vol 45 (430) p 203A (Oct)

Historical survey of the development of the instruments named above. Some of the most significant were: the first tapered tool joint patented by Whittier, *c* 1910; introduction of the seamless pipe, *c* 1914; the upset pipe, *c* 1919; the full hole joint, 1926, and its later developments; long drill collars, *c* 1914; the Hughes roller bit of 1909; self-cleaning cone bits, 1925; the roller core bit, 1926; application of jets to roller bits, 1948; carbide inserts, 1915; and the first diamond core drill of Leschot, 1863.

A *Nh.132.28/Plb.132.28*

Improved grade shown in Consolidated Discovery drilling

Anon. *Canad Min J* 1959 Vol 80 (8) p 139 (Aug)

Diamond and other drilling have led to the discovery of new blocks of rich ore in the Consolidated Discovery Yellowknife Mines. Flat diamond drilling at 3,200 and 3,350 ft levels indicated a continuation of the same grades encountered above. On the former, a flat drill hole gave 7.53 oz across 8.1 feet.

A *Cfb Nh.12.343*

Notes from South Africa

Anon. *Canad Min J* 1959 Vol 80 (7) pp 83-84 (July)

In the notes on the exploratory programme to find new gold and other mineral deposits in South Africa, information is given concerning a new drilling rig produced by Joy Sullivan (South Africa) which will make drilling faster, and a new type of drilling crown. These crowns have been developed by the Diamond Research Laboratory, Johannesburg. The diamond material used is processed to give longer drilling life and to suit the specific purpose for which it is to be used. Tests on granite gave a penetration of 5 ft 7¼ in. before the crown had to be replaced. Recovery of diamond is made easy and loss reduced by one third.

A *Cfb Nh.131.361*

Trackless mining at Gaspé copper

J. A. Hall. *Canad Min Metall Bull* 1959 Vol 52 (567) pp 430-440 (July)

In the detailed account of equipment and methods used, the description of drills and drill steels mentions a diamond drill for use in stoped areas in certain zones and in the open pit. The drill is mounted on an air-motor-propelled drill carrier. 18 illustr, 2 tables, 4 ref.

A *Cfb Nh.12.361*

Operations improvement: 1. Loosening the deposit

Anon. *Rock Prod* 1959 Vol 62 (9) pp 80-82 (Sep)

Drilling and blasting are still by far the most popular methods of loosening the rock in quarrying. Various improvements in drilling methods, including the development of a bit and drill steel with a 2 in. hollow centre which produces no core, have been made recently. 1 illustr. *A* *Bn Cfb Pl.132*

Diamond core drill

Bucyrus-Erie Co, Drill Div. *Rock Prod* 1959 Vol 62 (9) p 144 (Sep)

A six-page booklet contains information on the diamond drill which specialises in exploration coring for mines and quarries, reinforced concrete coring and boring for the installation of gas, telephone, electrical and water services, drilling pavement for testing cores, and general contracting drilling. [Not in library of Industrial Diamond Information Bureau].

A *Nhe.526*

New developments in drilling and producing

Anon. *Petrol Engr* 1959 Vol 31 (1) pp B19-23 (Jan); abstr *J Inst Petrol* 1959 Vol 45 (429) p 175A (Sep)

A *Cfb.132/Qc.132*

Drilling from floating vessels now economically carried out off California Coast

W. W. Rand. *J Petrol Tech* 1959 Vol 11 (9) pp 35-36 (Sep)

3 ref, 1 table. *A* *Cfb.342*

Phenomena affecting drilling rates at depth

A. J. Garnier, N. H. von Lingen. *AIME Petrol Trans* 1959 Vol 216 pp 232-239; *J Petrol Tech* 1959 Vol 11 (9) (Sep)

16 illustr, 6 ref, 3 tables. *A* *Cfb.21*

Reports from the geological surveys, Kenya, etc

Anon. *Overseas Geol & Miner Resourc* 1959 Vol 7 (4) pp 411-429

Amongst the projects carried out was the investigation of supposed diamond workings in South West Kenya. Diamond drilling has been carried out in all territories in geological investigations.

A *Cfb Nh.12.361*

A comparison among caliper log, γ-ray log, and other diamond drill-hole data

C. M. Bunker, H. C. Hamontre. *US Atom Energy Comm* 1955 TEM0785, 21 pp; *Nuclear Sci Abstr* 1959 Vol 13 abstr No 712; *Chem Abstr* 1959 Vol 53 (15) col 13904-13905 (Aug 10)

A *Cfb Nh.21*

Studies on drillability of rock by rotary drills (3rd report): resistance characteristics of rotary drilling

S. Konoshita. *J Min Inst Japan* 1959 Vol 75 (6) pp 375-380; *IMM Abstr* 1959 Vol 10 (1) p 8 (Oct-Nov) (Original in Japanese, summary in English)

D *Cfb Pl Unx*

Diamond core drill air powered

Acker Drill Co Inc, Scranton, Pa. *Canad Min J* 1959 Vol 80 (8) p 103 (Aug)

The Packsack diamond core drill is lightweight and completely portable and works with compressed air. It is suitable for underground drilling of test holes, blast holes, wall samples, and for plotting veins and exploratory drilling. The 1¼ in. bit has a thin diamond face, and requires lower quantities of water than most drills during operation. 1 illustr.

A *Cfb Nh Prw.12*

Shallow core prospect drilling

Anon. *Min J* 1959 Vol 253 p 167 (Aug 21); *IMM Abstr* 1959 Vol 10 (1) p 25 (Oct-Nov)

Notes on the Prosper portable diamond core drill manufactured by Craelius Co Ltd, London. Features of the drill are bit speed control, full interchangeability of the prime movers (petrol, electric or air motors), and low overall cost. *D* *Nhe*

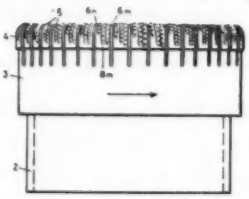
LITERATURE REQUESTS

Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.

FP 1,180,956 (Aug 8, 1957) **SA Précidia**

Rotary tubular drills for mine working. Trépans rotatifs pour le forage des puits

It has been found that the number of radial coolant passages in a drilling crown should be fairly large. It is proposed to have at least ten passages, in width 0.6 to 1.5 mm, between the diamond-studded portions of the drill. Figs 8 and 9 show the arrangement of 40 radial passages of 1.2 mm width and 0.9 mm depth in a drill of 131 mm diameter (standard dimension). The



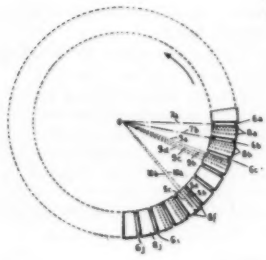


Fig 8 (top) and 9. Drilling crown with forty radial passages, 1.2 mm wide and 0.9 mm deep. FP 1,180,956.

diamond grains are so positioned that they are closer together in the first line of attack of a drill, rotating in the direction shown by the arrow, provided with grains set in radial rows so that diamonds of the next row are always operating in the intervals of the previous line of grains. (5 claims, 2 illustr).

J *Cfb Nhe.545/Cfb Plb.545*

WIRE DRAWING

Diamond drawing dies for wire drawing. Diamant-Ziehsteine zum Ziehen von Draehten

W. Rittmeier. *Maschinenmarkt* 1957 Vol 63 (101) pp 15-16; *Tech-Wiss Ber Osram* 1959 Vol 31 (11-12) p 200 (Oct 15) (In German)

On the results of research into the evaluation of diamond drawing dies the requirements for satisfactory drawing dies are stated. The structure of dies for special application, their advantages, such as resistance to bursting and wear, as well as the setting and polishing thereof, are described.

A *An Cn Nkb*

Drawing titanium and zirconium wire

R. Knight. *Wire & Wire Prod* 1959 Vol 34 (11) pp 1504-1505, 1547 (Nov)

2 tables. *D* *An Bfn Cn/An Bfu Cn*

Some pointers for diamond die users

Anon. *Wire & Wire Prod* 1959 Vol 34 (11) pp 1543-1544 (Nov)

Clean annealed wire should be drawn as diamonds are sensitive to shock and imperfections may give the die repeated blows. Drawing speeds for diamonds are practically the same as for other die materials; soft metals can be drawn at higher speeds than hard. Use of heavy stones is desirable to permit maximum recutting and polishing to the next size. The need for careful handling of diamond dies is stressed, and they should be replaced at first signs of scratching.

D *An Cn Nkb*

GRINDING AND POLISHING OF CARBIDES AND METALS

Modern industrial microscopy of metals and their alloys. La microscopie industrielle moderne des métaux et de leurs alliages

Anon. *Mach Mod* 1959 Vol 53 (608) pp 35-40 (Nov) (In French)

An important part of microscope technique is the preparation of the sample for examination. This comprises three stages: cutting, setting in a matrix, and polishing. Various machines are available for the first two operations. The polishing is done by a mechanical process or by a succession of mechanical and then electrolytic processes. Mechanical polishing is a slow and delicate operation performed, where hard materials are concerned, by means of carbide abrasive or diamond dust, although for normal purposes abrasives consisting of alumina or magnesium suspensions are used. Hoyt recommends rough machining followed by a first polishing with a copper disk coated by boron carbide wetted with kerosene oil; and a second polishing with a wooden wheel dusted by diamond dust bonded with almond oil. If diamond dust is to be used, a special cloth material, which will not cause waste by allowing particles to stick in it, is used as a base. D.P. cloth is recommended. All diamond particles must be of the same size and evenly distributed in the bond paste. Different grades suit different speeds. Diamond polishing is better than electrolytic polishing in cases where the inclusions to be determined are in certain types of aluminium, rolled steels, and in castings when large surfaces are to be examined. Various electrolytic polishers are available, and there are special acids for chemical erosion of different types of steel and metal. 19 illustr. (To be cont).

A *Bf Cz Vj/Bfa Chm Km*

Elgar machine tool demonstration

Elgar Machine Tool Co Ltd, 172-178 Victoria Rd, London W 3. *Machinery, Lond* 1959 Vol 95 (2454) pp 1124-1125, 1131 (Nov 25)

Machines demonstrated included the Italian-built Ghiringhelli for grinding and lapping tungsten carbide cutting tools. Four grinding wheels and work-tables at right angles to each other permit rough grinding of tool shanks, grinding and lapping of tips and grinding of chip-breaker grooves, in successive operations. One spindle takes silicon carbide wheels up to 6½ in. diameter; the other is for diamond impregnated wheels up to 5¾ in. diameter. Paraffin is fed to the diamond wheels by gravity from a small tank in the spindle head, while silicon carbide wheels are supplied with coolant from a motorized pump. 3 illustr.

D *Al Bkcb Chc Pr/Al Bkcb Chd Pr*

Microstoning

Taft-Peirce Mfg Co, Woonsocket, RI. *Mech Engng, NY* 1959 Vol 81 (11) p 80 (Nov)

A low-temperature, low-pressure abrading operation using bonded abrasive stones is said to generate a controlled micro-inch finish on practically any material, at the same time correcting geometrical errors made in previous machining. The load is such that it shapes itself readily to the mean work radius and wears away uniformly, so that fresh cutting edges are presented to the work. Most microstoning is with vitrified bonded abrasive stones, using silicon carbide abrasive, grit sizes 300 to 1,200. The stones are made variable in hardness, and the process is carried out with a Supfina machine tool attachment. 3 illustr.

D *Chcz Rgc Urf*

Increasing importance of synthetic diamond in industry. Zunehmende Bedeutung synthetischer Diamanten in der Industrie

G. Pahlitzsch. *Umschau* 1959 Vol 59 (19) p 602 (Oct 1) (In German)

Synthetic diamond is not good enough for use as a gemstone but is suitable, owing to its grain-structure which differs slightly from natural diamond, for grinding hard metals and plastics. 2 illustr, 3 ref.

A *Bf Chc Fh/Bp Chc Fh*

Hand lapping tool line offered for carbide and steel tools

Titan Tool Supply Co, Box B, 1419 Hertel Ave, Buffalo 16, NY. *Amer Mach* 1959 Vol 103 (24) p 228 (Nov 16)

Tetrabor hand lapping tools for sharpening and lapping carbide and hardened steel tools have working area made from selected boron carbide which is claimed to approach diamond in hardness. 1 illustr.

D *Al Bk Chd Pg Rgb*

The effects of atmosphere on dry grinding steel with Al_2O_3 coated abrasives

E. J. Duwell, W. J. McDonald. *ASME Prep* (59-LUB-6), 5 pp, 1959; *Index aero* 1959 Vol 15 (11) pp 90-91 (Nov)

It was found that the metal surface created during the grinding of steel with aluminium oxide coated abrasives rapidly react with oxygen in the atmosphere. This decreases the coefficient of friction, resulting in a higher rate of cut for sharp cutting particles and increased abrasive life. Reactive forms of chlorine, sulphur, bromine, and a number of other group VIA and VIIA elements were found to be more efficient than oxygen in decreasing the coefficient of friction.

D *Bfd Chc Rdb Rj*

Abrasives used for the machining of stainless steels. L'impiego degli abrasivi nella lavorazione degli acciai inossidabili

D. Griffini. *Macchine* 1959 Vol 14 (11) pp 1051-1064 (Nov) (In Italian)

Types and grain structure of abrasives are described, as well as grinding wheels, machines and machining processes. A table shows the various degrees of finish according to the operation and type of abrasive used. 21 illustr, 18 ref, 4 tables.

M *Bfd Chc Pe*

Fast grinding forms small torsion bars

B. C. Brosheer. *Amer Mach* 1959 Vol 103 (24) pp 128-130 (Nov 16)

Describes production of torsion bars from SAE 1144 stress-proof steel, hardened and drawn to 30-34 Rc in five operations. These include rough and finish plunge centreless grinding, broaching serrations at both ends, and final grinding. 11 illustr.

D *Az Chc*

Automatic cutter grinder supplements production milling

Cincinnati Milling Machine Co, Cincinnati 9, Ohio. *Grinding & Finishing* 1959 Vol 5 (7) pp 63-64 (Nov)

A new automatic cutter grinder sharpens identical cutters after set-up without attention. The operator decides how many teeth are to be ground between truings and how many passes of the diamond will be required, and he sets these numbers on the control panel. At the pre-set intervals, the diamond advances 0.001 in. per pass and makes the scheduled passes. For each 0.001 in. advance of the truing attachment, the saddle pickfeeds 0.001 in. to compensate. 2 illustr.

D *Al Chc Pr:Nj Psf*

Grain-in-depth abrasive wheels said to last 20 times longer

American Buff Co, 2414 S LaSalle St, Chicago 16, Ill. *Amer Mach* 1959 Vol 103 (24) p 194 (Nov 16)

Uniflex and Amflex buffs, containing grain-in-depth instead of grit coating, are said to outlast ordinary cutting-polishing wheels by 20 : 1. 1 illustr.

D *Pk*

A reader comments on segment specs

R. A. Bingley (Abrafract Ltd). *Grinding & Finishing* 1959 Vol 5 (7) p 21 (Nov)

To the suggestion of a British reader that a segment for grinding cast iron is self-dressing if of correct grade, the reply is that although such grades are probably widely used in America they would be far too costly on high production jobs. The comparative use and uses of resinoid and vitrified segments in the two countries are discussed. *D* *Bfca Chc Pez*

Grinding at supercritical speeds

R. T. Hukki (Finland Institute of Technology, Helsinki). *Brit Chem Engng* 1959 Vol 4 (8-9) pp 446-449 (Aug-Sep); *Metal Powd Rep* 1959 Vol 14 (2) pp 18-19 (Oct)

Summarizes results of investigations carried out at the State Institute for Technical Research, Helsinki.

D *Uqfc.1312*

Modern foreign grinding machines (short review)

A. I. Rivkin. *Mach & Tooling* 1959 Vol 30 (7) pp 25-31 (Original in Russian)

A Russian appraisal, dealing mainly with American and West German models. The use of diamond wheels and honing stones is mentioned and it states that the development of diamond machining seriously challenges electro-abrasive methods. 26 illustr.

D *Ceq N*Ceqn/Chc Nv Pr/Chh Nqe*

Simultaneous grinding of cylindrical and face surfaces on a centreless grinding machine

P. Giustina. *Mach & Tooling* 1959 Vol 30 (7) pp 32-33 (Original in Russian)

7 illustr. *D* *Chcc Pr*

Hirth type SM118 automatic internal spline grinder

Albert Hirth AG, Stuttgart-Zuffenhausen, Germany. *Machinery, Lond* 1959 Vol 95 (2453) pp 1056-1057 (Nov 18)

Depending on the number of grinding wheels to be used, either one or two diamond truers are incorporated in the worktable. They can be accurately set to suit the width of the splines to be ground. Slots from 0.051 to 0.342 in. deep can be made in bores of 0.433 to 6.889 in. diameter. 2 illustr.

D *Az Chc Pr:Nj Psf*

Grinding fixture

Cavic Engng Co, 1313 W Essex Ave, Kirkwood 22, Mo. *Tool Engr* 1959 Vol 43 (5) p 151 (Nov)

A fixture for grinding threading tools up to $\frac{1}{4} \times \frac{1}{4}$ in. requires no setting or adjustment and is said to eliminate poor thread form and improper clearance angle. 1 illustr. *D* *Alz Chc Psz*

Drill pointer

Winslow Product Engng Corp, 47 St Joseph St, Arcadia, Calif. *Tool Engr* 1959 Vol 43 (5) p 159 (Nov)

Drill points between 0.032 and 1.50 in. diameter are achieved with the model 100 Winslow-Matic which automatically produces helical and conventional points concentric within 0.0002 in., it is claimed. 1 illustr.
D *Alb Chc Pr*

Maintenance of a polishing wheel. Die Behandlung der Polier-Scheiben

W. Burkart. *Dtsch Goldschmiede Ztg* 1959 Vol 57 (10) insert p IV (Oct) (In German)
A *Pez.138*

Rod mill rolls formed by grinding

Sheffield Corp. *Iron Steel Engr* 1959 Vol 36 (4) p 156 (Apr)

A grinding method for forming and re-dressing passes in rod mill rolls has been developed. It is an extension of the company's 'Crush-true' wheel forming and dressing process used for precision thread and form grinding since 1940. 2 illustr.
A *Ag Chcbc.1456*

Accurate centers and center holes

E. C. Enos. *Grits & Grinds* 1959 Vol 50 (7) pp 10-13 (July)

The two most common results of bad centring are probably poor finish and out-of-roundness. Some of the actual conditions which cause these are described, as are other errors. Simple rules to ensure good grinding are listed. 2 illustr. *D* *Chc Pz*

Barrel-finishing

E. Stevens. *Grits & Grinds* 1959 Vol 50 (7) pp 14-15 (July)

Barrel finishing is said to be a good practical way of forming a 0.002 to 0.004 in. radius on throwaway carbide inserts, and can be used as an alternative to manual methods using a diamond hone or diamond wheel. *D* *Al Bkc Chmz*

A backward glance . . . and a forward look

E. T. Larson. *Grits & Grinds* 1959 Vol 50 (6) pp 3-7, 10-15 (June)

Surveys fifty years of publication. Development of grinding technique, including the use of diamond wheels, is covered. 11 illustr.
D *Chc Nv.132*

Grinding Wheelology

'Old Dutch'. *Grits & Grinds* 1959 Vol 50 (6) pp 8-9 (June)

The importance of correct maintenance of general purpose grinders is stressed, and possible faults of machines and grinding wheels are listed.
D *Pe.21*

New natural diamond grit

Anon. *Diamond News* 1959 Vol 23 (1) pp 13, 15 (Oct) 1 illustr; *Optima* 1959 Vol 9 (3) pp 160-161 (Sep); abstr *Industr Diam Abstr* 1959 Vol 16 p A242 (Dec)
D *Kl*

Teddington caliper gauge for cylindrical grinders

Teddington Industrial Equipment Ltd, Sunbury-on-Thames. *Machinery, Lond* 1959 Vol 95 (2453) pp 1059-1060 (Nov 18)

An adjustable caliper gauge for cylindrical grinders, for use with pneumatic size control or gauging equipment. Designed for mounting on a machine, it is adjustable to cover the range from $\frac{1}{4}$ to 6 in. diameter. 1 illustr. *D* *Chcl Pr Wbz*

Universal grinder

Heald Machine Co. *Iron Age* 1959 Vol 184 (15) p 126 (Oct 8)

A high precision grinder for internal, external, and rotary surface grinding, the machine will grind straight taper bores, outside diameters, flat, convex or concave surfaces. *A* *Chcm Pr/Chcn Pr/Chcz Pr*

Crush grinding for forming plastic cylinders, tubes

R. L. McKee. *Grinding & Finishing* 1959 Vol 5 (7) p 23 (Nov)

A specialized centreless grinder for crush-form grinding, forms cylindrical parts up to 8 in. long and $1\frac{1}{2}$ in. diameter from laminated plastic or vulcanized fibre stock to tolerances as close as 0.0005 in. or tighter, and at rates up to 20% faster than by conventional methods, it is claimed. 1 illustr.
D *Ag Bp Chcbc*

Job shop production grinding anti-friction bearings at I.H.

M. M. Patterson. *Grinding & Finishing* 1959 Vol 5 (7) pp 34-37 (Nov)

Describes equipment and techniques used by International Harvester in grinding both ball and roller bearings in the same anti-friction bearing department. For the greatest economy and precision, nearly all the operations are grinding. Among machines used are No's 2, 3 and 4 Cincinnati centreless grinders for grinding the outside diameter of the inner (land) and outer races, and the cups for roller bearings. 10 illustr.
D *Ay Chc Pr*

Economy in buffing and polishing . . . a water pitcher

Anon. *Grinding & Finishing* 1959 Vol 5 (7) pp 41-43 (Nov)

Over half the sixty-seven operations needed to produce a silver-plated water pitcher are devoted to grinding, polishing and buffing. Six major finishing operations are described. 4 illustr.
D *Az Bfbb Cz:Chc/Az Bfbb Cz:Chm*

Centerless belt set-up grinds long tubes

San Francisco Plant, Otis Elevator Co. *Grinding & Finishing* 1959 Vol 5 (7) p 43 (Nov)

Tubular steel elevator plunges up to 16 in. in diameter are centreless ground to a specified finish and almost perfect concentricity, it is claimed, on a Model 614 Production Machine Co centreless grinder. 1 illustr.
D *Az Chcc Pee*

The production of Borletti sewing machines

Fratelli Borletti, Spa, Milan. *Machinery, Lond* 1959 Vol 95 (2455) pp 1140-1148 (Dec 2)

Finishing operations on the arm after it has been assembled to the base are described. 11 illustr.
D *Az Chm*

LITERATURE REQUESTS

Please quote the page number of the Bibliography containing the original reference, and the author and title of the article, in all cases.

Newest Norton grinding machine

R. E. Fleming. *Grits & Grinds* 1959 Vol 50 (7) pp 3-6 (July)

The No 2 Straddle-Bearing grinder is said to embody three major advances in centreless grinding: the straddle-bearing spindle support for both grinding and regulating wheels provides greater rigidity and ruggedness, and thus increases capacity to take heavy cuts while permitting fast grinding to close tolerances under all conditions; the profile grinding wheel head ensures fast sizing and mobile grinding; and regulating wheel heads mean that work loading arrangement is never disturbed by wear of either wheel. 7 illustr.

D *Chcc Pr/Chch Pr*

Drill point thinning machine

Sheffield Twist Drill & Steel Co Ltd, Sheffield 11. *Machinery Lloyd* 1959 Vol 31 (23A) pp 57-58 (Nov 14)

The machine handles two-flute drills from 5/16 in. to 3 in. with spiral or straight flutes and straight or tapered shanks. 1 illustr. *D* *Alb Chcz Pr*

Progress in machine polishing

J. H. Bryan, J. P. Dewar. *Metal Ind, Lond* 1959 Vol 95 (16) pp 342-343 (Nov 27)

A paper given at a recent Institute of Metal Finishing Symposium describing trends in machines and methods.

D *Bf Chm Pr.132*

Automatic polisher 'super-finishes' shafts

Anon. *Metalworking Prod* 1959 Vol 103 (45) p 1780 (Nov 6)

A five-fold improvement of surface finish is achieved on these highly-stressed main gear shafts at Ford AG of Cologne by brush-polishing them in a 25 sec cycle on a special automatic polishing machine. The finish produced is similar to a honed or lapped surface. 1 illustr. *X* *Agn Chm Prs*

Lappex 'micronized' lapping compound

General Engineers' Supply Co (1937) Ltd, 555 High Rd, Leytonstone, E 11. *Machinery, Lond* 1959 Vol 95 (2454) p 1099 (Nov 25)

Lappex incorporates very small, hard particles said to ensure that there is no movement between the abrasive and the shallow depressions in the work surface. Since particles do not become embedded in the metal, complete removal of the compound after lapping is possible, and the risk of continued abrasive action avoided. Lapping and polishing can be done on a variety of steels, non-ferrous metals, and some thermoplastics. *D* *Chd Pdz*

Finishing machine for carbide tools

Elgar Machine Tool Co Ltd. *Mach Shop Mag* 1959 Vol 20 (11) pp 670-671 (Nov)

A Wendt tool finishing machine, model Wo-M, suitable for finishing ceramic cutters and grinding high speed tool steels, uses a small diamond-impregnated finishing stone, which passes over the cutting tool edge. Oscillating and overlapping movements of the stone, both vertically and horizontally, occur simultaneously at different frequencies and amplitudes. In this way it is claimed, a cutting edge jaggedness and surface finish of less than 0.5Mμ are obtained, resulting in a 50% longer tool life than after grinding with a diamond wheel. An additional model is specially designed for finishing form tools of a particular shape. For grinding high speed tool steels silicon carbide stones can be supplied.

[See Patent DBP 971,514; abstr *Industr Diam Abstr* 1959 Vol 16 p A218 (Nov)]. 1 illustr.

D *Al Bl Chm Nv*

Some typical operations on components for missile guidance systems

Kearfott Inc, Little Falls, NJ. *Machinery, Lond* 1959 Vol 95 (2453) pp 1043-1047 (Nov 18)

Inner races of bearings are burnished to a 3½ micro-in. finish with a mono-crystalline ceramic wheel trued to the required radius. After burnishing, the inner races are polished to a 1 micro-in. finish with diamond paste or with a 3,000-grit aluminium oxide rope. 8 illustr.

D *Ay Chm Kmg*

Elb 2-spindle machine for grinding connecting rods

Soag Machine Tools Ltd, London SE 11. *Machinery, Lond* 1959 Vol 95 (2455) pp 1164-1165 (Dec 2)

A 2-spindle, electro-hydraulic machine forms part of a transfer line. During the working cycle 0.008 to 0.012 in. of metal is removed from each joint face of two connecting rods by cup-shaped grinding wheels. The grinder can be used independently if required. Wheel truing at suitable intervals is automatic. 2 illustr. *D* *Agz Chc Pez Pr*

The nature of polished metal surfaces

Anon. *Aust J Sci* 1959 Vol 12 (6); *Nature, Lond* 1959 Vol 184 (4695) p 1280 (Oct 24)

A paper by L. E. Samuels on work done at the Defence Standard Laboratories strongly supports the earlier view that polishing is essentially a fine cutting process, and is believed to establish with reasonable certainty that the Beilby layer does not exist.

D *Bf Chm Unf.21*

Automatic grinding of chamfers

Anon. *Mach Shop Mag* 1959 Vol 20 (11) pp 662-663 (Nov)

An automatic set-up for the grinding of chamfers on the outer corners of the cylindrical components is illustrated in schematic form. 2 illustr.

D *Az Chc Prs*

Shot blast cleaning of rods. La pulitura meccanica della vergella

A. Oreffice. *Macchine* 1959 Vol 14 (11) pp 1109, 1111, (Nov) (In Italian)

The machine used is a 'Wheelabrator'. 4 illustr.

M *Pz Qeb Rd*

Studies on vitrified grinding wheels: I, results of preliminary experiments

Y. Ito, T. Horibe, Y. Ishida. *Nogoya Kogyo Gijutsu Shikensho Hokoku* 1952 Vol 1 (5) pp 39-44; *Amer ceram Abstr* 1959 Vol 42 (10) p 279 (Nov) (Original in Japanese)

Results of tests when bonding materials of the clay-feldspar-quartzite system were investigated because of their wider range of softening temperature.

D *Pe Urf.21*

Diodes and transistors in orbit

A. H. Carr. *Grits & Grinds* 1958 Vol 49 (5) pp 3-12; *Amer ceram Abstr* 1959 Vol 42 (11) p 279 (Nov)

The use of grinding wheels in the slicing (or wafering), lapping, and dicing of semiconductor devices is described. *X* *Bde Cej Pe/Bde Chd Pe*

Christen-Amiet 01-2 drill grinder

G. Zwicky (London) Ltd, 193 Victoria St, London SW 1. *Metalworking Prod* 1959 Vol 103 (46) p 1846 (Nov 13)

Concentric grinding of right- and left-hand, straight and twist drills, and end mills from 0.004 to 0.008 in. diameter can be done on this machine. For wheel truing, a diamond is mounted in the chuck holder. 1 illustr. *D* *Alc Chc Pr/Alz Chc Pr*

Film proves that grinding wheels form chips. Le film prouve que les meules font des copeaux

Anon. *Machine-Outil Franç* 1959 Vol 24 (148) p 215 (Nov) (In French)

With a light intensity of 800,000 candle power (English candle = 0.9 of the French value) and an exposure time of 1/240000th of a second, allowing 16,000 pictures to be taken per second, it was possible to take photographs showing that grinding is not a continuous operation. The causes are the vibration and the heterogeneous composition of the wheel. Titanium and steel were machined. Titanium was found to be soft as it left the wheel, while steel formed true chips of from 6 to 12 mm, which oxydized and seemed to melt. Further research is to be carried out. 2 illustr.

A *Chc.131*

Wright 58/ES surface finisher

Wright Electric Motors (Halifax) Ltd, Pellon Lane, Halifax. *Metalworking Prod* 1959 Vol 103 (46) p 1847 (Nov 13)

This machine has been developed for surface finishing and polishing of small components. It employs coated abrasive disks available with a variety of coatings to suit the metalworking, plastics or woodworking industries, or for polishing samples for microscopic checks, micrographs and similar applications. 2 illustr.

D *Az Chm Pr*

FP 1,178,553 (June 19, 1957) **SA des Meules Norton**

Method of obtaining articles with an abrasive or rough surface and articles thus obtained. Procédé d'obtention d'objets à surface abrasive ou rugueuse et objets ainsi obtenus

There are two main types: (*i*) with abrasive grains uniformly distributed throughout the article and perhaps of increased density towards the periphery; (*ii*) with abrasive grains in or near the periphery, only the grains projecting from the surface. The specification refers to the latter type. The grains are secured by an adhesive to a sheet of textile material or paper which is placed against the wall of a mould, the grains being oriented towards the interior of the mould. Then a bonding material is injected under pressure in molten or plastified state so as to envelop the grains except on that side which is stuck to the sheet. On detaching the sheet the grains are laid open, forming a rough or abrasive layer. The grains may be diamond, aluminium oxide, silicon carbide, boron carbide sand (as abrasive), flint, granulated metal, metal carbides or other hard material of a size of some mm to some 0.01 mm. The bond may consist of metals or alloys of low melting point, or of thermo-plastic materials but not of thermo-setting or ceramic materials. (2 claims, 2 illustr).

J *Ab Cs.545*

DAS 1,058,397 (Aug 18, 1953) **W. Osenberg**

Method for making resin bonded grinding bodies. Verfahren zum Herstellen kunstharzgebundener Schleifkoerper

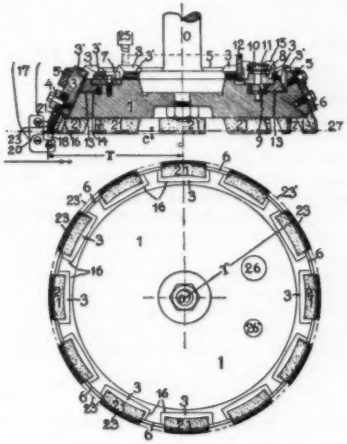
In order to obtain a porous structure despite the very dense arrangement of abrasive grains when using the method of injecting a resin bond into a ventilated mould, in which the grains have previously been subjected to vibration and subsequent compression, the bond is formed by a synthetic resin foam. A usual foaming agent may have been placed in the mould already, together with the abrasive grains. (2 claims). Ref cited: 1 DBP; 3 GP; 1 FP; 1 USP. (Add DAS 1,051,683).

J *Ab Urb:Qc.545*

FP 1,181,402 (July 30, 1955—conv date, Japan) **J. Inoue**

Method and apparatus for grinding gear teeth with cylindrical surfaces. Procédé et appareil pour rectifier les dents d'engrenages à surface cylindrique

The method is applicable to both straight gear wheels and conical gear wheels and is based on the consideration that curved teeth with cylindrical surfaces are theoretically superior, as they may be used on all gears from plane to spherical gears. The method is illustrated in Fig 12 for straight gears and in Fig 13 for conical gears. The various generating points 35, 35_1, 35_2, *etc* of circle 23 describe involutes I′, I_1′, *etc* of base cylinder B, I_0, I_0′, *etc* are involutes of base cylinder B_2.



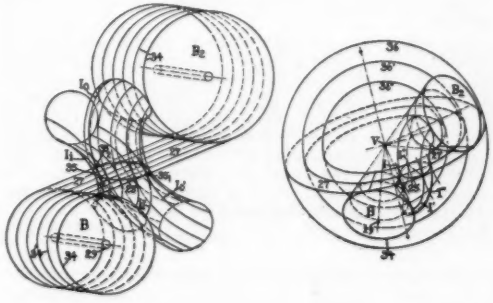


Fig 10 and 11 (above). Annular wheel for grinding gear teeth.

Fig 12 (below, left). The method for grinding straight gears.

Fig 13 (below, right). The method for conical gears. FP 1,181,402.

Similar considerations apply to conical gearing in Fig 15. Grinding of the gear teeth is effected by an annular wheel according to Fig 10 and 11 whose diameter is kept constant by the arrangement of the abrasive stones 21 in guide ways 16, to be adjusted by threaded ring 13 meshing with the threads in sliding blocks 3. (6 claims, 9 illustr).

J *Ad Chch Pe.545*

MACHINING DEVELOPMENTS

US trumps Russia's spark machining ace

Anocut Engng Co, Chicago. *Amer Mach* 1959 Vol 103 (23) p 99 (Nov 2)

A new electrolytic machining unit, with die-sinking performance said to surpass that of the existing Russian model, has been developed by Anocut. Metal-removal rate is 18 to 60 cub in./hr, finish between 10 to 100 micro-in., with no electrode wear. The electrolytic process had already been used by Anocut but only with a rotating wheel : now a non-rotating shaped electrode is plunged directly into the workpiece. Normal accuracy is 0.001 to 0.002 in., but better than 0.0005 in. has been achieved. 2 illustr, 1 table.

See also *Amer Mach* 1959 Vol 103 (15) pp 92-93 (July 27) ; abstr *Industr Diam Abstr* 1959 Vol 16 (9) p A169 (Sep).

D *Ceqm Pr.33*Ceqm Pr.342*

Characteristics of spark erosion circuits

P. G. Farley. *Metal Treatm* 1959 Vol 26 (170) pp 405-420 (Nov)

A paper and subsequent discussion, part of a symposium on spark machining, analyse the characteristics which the electrical circuity must invariably impose on the machine tool and compare these for various systems, so far as available information allows. Circuits attaining high machining rates have already been developed for machining large workpieces, but the original relaxation circuit must still be used for finishing operations. Thus immediate future developments need to be in application techniques, although new circuits will certainly be devised to meet widening demand. 15 illustr, 13 ref.

D *Ceqm.21*

Electric discharge machine gets 10 microinch finish

Electro-Spark Co Inc, 23 E 26th St, New York 10. *Amer Mach* 1959 Vol 103 (23) p 146 (Nov 2)

An Italian electric erosion machine, model E-500, for machining tungsten carbides, hardened steels and similar metals, now has added improvements. These include finishes up to 10 micro-in. and horizontal automatic feed. 1 illustr.

D *Bfd Ceqn Pr.3225/Bkcb Ceqn Pr.3225*

USP 2,885,529 (Jan 12, 1956) **J. H. Nelson, Kropp Forge Co**

Method of and apparatus for electric finishing of metal articles

This refers to a special electrode construction for the finishing of a turbine wheel or the like by electrical discharge machining. The electrode is made oversize, preferably forged of brass. During the machining process in a bath of dielectric coolant, the electrode becomes worn and is then restruck in a press to obtain again the accurate contour to be imparted to the turbine wheel. The electrode possesses reserve material *ie* a back-up portion, which is utilized for this purpose. (14 claims, 5 illustr). Ref cited : 4 USP.

J *Az Bf Ceqh.545*

USP 2,886,693 (Aug 12, 1957) **M. J. Harris, G. H. Townend**

Spark machining apparatus

Accuracy and surface finish are improved by reducing the tendency to arcing. The spark gap between tool electrode and workpiece is maintained at a predetermined length by a feed motor and transmission of high velocity ratio and negligible lost motion. The rate of charging the condenser is controlled by a special circuit, which limits overrun of the motor to a small value by an electrical connection between an output tapping point in an a.c. circuit, the motor winding, and one plate of the condenser. The transmission includes a worm drive and a friction drive unit providing a reduction of 10,000 to 15,000 : 1. (14 claims, 8 illustr). Ref cited : 2 USP.

J *Ceqm Pt.545*

USP 2,887,561 (June 8, 1956) **C. P. Porterfield, Firth Sterling Inc**

Control for spark machining apparatus

The spark gap is automatically controlled to maintain the optimum spacing between electrode-tool and workpiece. This is achieved by an arrangement diagrammatically shown in Fig 14, in which the electromotor

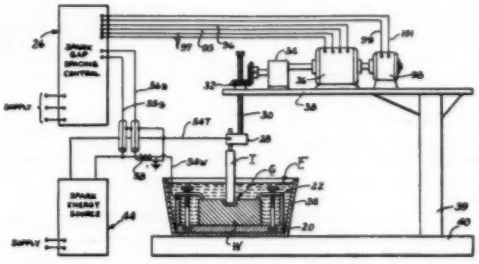


Fig 14. Diagram of the arrangement for automatically controlling the spark gap. USP 2,887,561.

36 for feeding tool T is coupled to a tachometer generator 98, its speed and direction being controlled by the control 26 connected to tool-electrode, workpiece, motor and generator. (4 claims, 10 illustr). Ref cited : 1 USP ; 1 FP.

J *Ceqm Pt W p.545*

FP 1,178,471 **E. M. Williams, C. P. Porterfield, Firth Sterling Inc**

(Apr 20, 1956 ; Mar 11, 1957—conv date, USA)

Device for machining by electro-erosion. Dispositif d'usinage par électro-érosion

The device is specially adapted to the 'grinding' of cutting tools manipulated by the operator to obtain the desired profile and sharpness. For this reason, the speed of stock removal can be varied to be high for the profiling step and low for the sharpening step. (19 claims, 21 illustr). *J* *Ceqn Pt.545*

IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

FP 1,178,722 **Birmingham Small Arms Co Ltd**
(July 12, 1956—conv date, Gt Britain)

Method and machine for spark machining. Procédé et machine pour l'usinage par étincelage

The workpiece is subjected to vibration in the direction of the required penetration of the tool, which is constantly fed in this direction. This method is particularly favourable for spark machining as the electrode is constrained in the direction of penetration only by the feeding force, otherwise it can vibrate freely in this direction under the influence of the forces transmitted by the repeated contact of its end face with the vibrating workpiece. The rebound of the tool produces the gaps for the formation of sparks while the feeding movement ensures that the electrode, after each contact, is in the required position for the next contact. When using an electrode of about 1.8 mm diameter and a feeding pressure of 50 gr for a tool weight of 350 to 650 gr, a frequency of 19 periods per sec is generally advantageous. No compensation for electrode wear is necessary when drilling narrow holes. (13 claims, 16 illustr). *J* *Ceqm Pt.545*

FP 1,179,403 **C. P. Porterfield, Firth Sterling Inc**
(June 8, 1956—conv date, USA)

Device for machining a conductive workpiece by electro-erosion. Dispositif d'usinage par électro-érosion d'une pièce conductrice

In spark machining, continuous control of the spark gap or of the spark discharge between the electrode and the workpiece is essential in order to obtain maximum efficiency. Automatic maintenance of the gap at an optimum during machining is effected by means of a series of time-spaced voltage pulses derived from signals fed back from the controlled spark and dependent on the size of the spark gap. (8 claims, 10 illustr). *J* *Az Bz Ceqn.545*

FP 1,181,502 **SA Soudure Electrique Languepin**
(Aug 19, 1957)

Method and device for the generation of current pulses, in particular applicable to spark machining. Procédé et dispositif permettant la génération d'impulsions de courant, applicable en particulier à l'usinage par étincelles

The usual arrangements use condensators or inductances for the accumulation of energy. These have certain disadvantages, such as limitation of charging time to avoid arcing or losses in the transformer. The production of impulses by rotary machines has not been satisfactory hitherto because the spark could be created only progressively and not abruptly, which led to inaccurate work. These disadvantages have been overcome by superimposing a continuous tension and a certain number of sinusoidal tensions according to certain equations, using a number of alternators on the same shaft as the generator for the continuous tension. Amplitude and phase of the alternators is controllable for adjustment of the total current of the different sources. (10 claims, 7 illustr).
J *Ceqm.545/Ceqn.545*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

PRODUCTION, GRADING & RECOVERY OF ABRASIVE PARTICLES

Examination of the grain toughness of abrasives. Die Untersuchung der Kornzaehigkeit von Schleifmitteln K. Diessen. *Radex Rdsch* 1959 (5) pp 640-659 (In German)

Abrasives were tested for their toughness and hardness by various methods, all of which entailed destruction of the grains and subsequent sieving of the resulting grain mixture. Methods varied in effectiveness when the results were compared. Of the various sizing methods used to establish the results of the tests only the mechanical method proved adequate. Sizing by hand caused considerable dispersion. The initial quantity of grain materially influenced the precision of the method. At present the best methods seem to be the abrasion and the press ram test, which are not entirely equalled by the centrifugal method. 23 illustr, 15 ref, 5 tables.
A *Chc Rd Unh*

Gas and dust measurement. Gas- und Staubmessungen F. Matouschek. *Radex Rdsch* 1959 (5) pp 665-672 (In German)

Measurements of gas and dust are made with a pilot tube and BEWAG zero sound. 12 illustr, 3 tables.
A *Un V*

TOOL PRODUCTION

Two-flute carbide-tipped end mill

Brown & Sharp Mfg Co, Providence, RI. *Machinery, NY* 1959 Vol 66 (3) p 202 (Nov)

A Nelco centre-cutting, two-flute carbide-tipped end mill, for machining all materials, is a true helix type designed to take plunge cuts and perform peripheral milling operations. Freer shearing action in plunge cuts, greater chip clearance, and added flute strength, are among advantages claimed. 1 illustr.
D *Cff Pdcb*

Carbide applicator

OK Tool Co Inc, Milford, NH. Tool *Engr* 1959 Vol 43 (4) p 149 (Oct)

Wear resistance of drills, taps, single-point turning tools, press tools, stress sections of large dies, planer blades, end mills and other tools can be increased with carbide. This impregnator unit applies either a coarse or fine layer of carbide to the cutting surface of high-speed tools. 1 illustr.
D *Bk Pd Qjz Ungd*

Convair's experience with ceramic milling cutters

F. A. Monahan. *Machinery, NY* 1959 Vol 66 (3) pp 121-122 (Nov)

Tests have convinced Convair engineers that, with the co-operation of manufacturers, ceramic tools can be produced to machine high-tensile alloys necessary in the aircraft industry. 3 illustr.
D *Cff Pdd*

Development of ceramic cutting material

V. Cerny, F. Vintner. *Sklar a Keramik* 1959 (11) pp 333-337 (Nov) (Original in Czech)

8 illustr, 9 ref. *M* *Pdd.132*

Machining metal powder parts

P. ten Imber. *Tooling* 1959 Vol 13 (12) pp 65-66 (Dec)

Machining requirements are usually confined to incorporating features in the components which cannot easily be imparted by the die. Provided that tool geometry is adapted to the type of material encountered, machining is readily done on a repetition basis. For all repetition work on sinterings, carbide-tipped tools should be used; for light, extensive cuts, diamond-tipped tools are advisable. A table shows recommended tool geometry for general turning, which is done dry, as is drilling and tapping. Carbide-tipped drills have a far greater effective life than the HSS drills often used. Other operations described include milling, broaching, reaming, and burnishing. 2 illustr, 1 table.

D *Az Bfy Ceq*

BP 817,051 (Oct 14, 1954) **L. A. Sayce, G. D. Dew, National Research Development Corp**

Production of diffraction gratings

Copies of diffraction gratings are made by cutting a master helix on a carefully prepared polished cylinder on which a pellicle (cellulose acetate or nitrate, polymethyl methacrylate, polystyrene) is then moulded, detached, opened out flat and mounted. A replica is made by impressing gelatine with the pellicle. Thus, copies can be made of greater length than was hitherto possible by a simple moulding process, without requiring optically flat glass blanks as support and which are in phase throughout their length. The first grating is placed with its ruled side onto a first part of the surface of a flat rigid support. The space between grating and support is filled with a liquid to be cold set to a transparent stable resin and the grating separated after setting. The grating is then replaced further along, repeating the operations until the total length of copy grating is produced. (20 claims, 5 illustr). Ref: BP 684,846; 708,539 (master helix); 468,893; 468,942 (replica). *J* *Ag Br Cp Tfb.545*

USP 2,889,138 (July 6, 1955) **D. W. Haglund, Sandvikens Jernverks AB**

Rock drill cutting insert

It has been proposed to make inserts with zones of different resistance to wear. A hard insert now wears down more slowly than a tougher insert but breaks more easily and cannot be worn down as far as a tougher insert. The advantages of hardness and toughness can be combined by varying the grain size in the insert while maintaining the same content of bonding metal in the different parts of the insert. A simultaneous variation of grain size and contact of bonding metal (cobalt) is possible in certain cases. The fine-grained hard metal is used in the upper part of the insert including the cutting edge; the lower part consists of coarse-grained hard metal. The cobalt content is preferably between 6 and 9%, the grain size of the hard metal 1 to 2.5 microns for the more wear resistant layer, changing to 3 to 5 microns for the tougher layer. (7 claims, 7 illustr). Ref cited: 3 USP; 3 BP. *J* *Bn Cfb Plz.545*

BP 817,002 (Nov 29, 1954) **E. F. S. Crowe, National Research Development Corp**

Cutting tools for lathes or other machine tools

Cutting, *eg* lathe tools, with hard metal bits inserted and clamped in a recess of the tool body should meet certain conditions, *ie* they should be positioned so as to support the insert as closely as possible to its cutting edge, clamped so as to be easily re-ground, and held so as to transmit stresses set up during cutting directly to the tool body. Present designs do not satisfy all these requirements. Figs 15, 16, 17, and 18 show a tool body

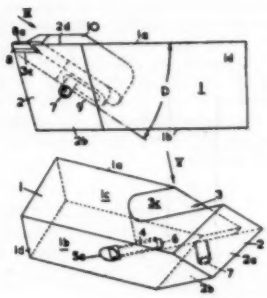
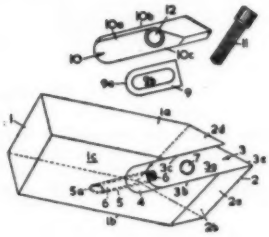


Fig 15, 16 (above) and 17, 18 (below). Four views of the adapted tool body. BP 817,002.



better adapted to fulfil the conditions set out above. The elongated recess 3 is inclined in two directions, rearwardly and downwardly from the nose portion of the body and in a downward direction transversely. Bit 8 is positioned in front of shoe 9 and clamped by clamp 10 through clamping screw 11 in hole 7 while the bottom end of bit 8 abuts against shoe 9 adjusted by screw 6. The end thrusts are then transmitted to the tool body and re-grinding can be carried out with a minimum removal of hard metal. (11 claims, 8 illustr). *J* *Ceqb Pd Qc.545*

IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free:

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

POWDER METALLURGY

High-strength vanadium alloys

Anon. *Prod Engng* 1959 Vol 30 (45) p 7 (Nov 2)

High-strength vanadium alloys showing good thermal conductivity, corrosion resistance and weldability, can be prepared by combining this metal with titanium and columbium. These alloys have a low coefficient of expansion and are easy to fabricate.

D *Bfxz U*

Hard-metal find

Caterpillar Tractor Co. *S Afr Min (Engng) J* 1959 Vol 70 Pt 2 (3481) p 1101 (Oct 30)

A new metal, which can be hardened to twice the depth of previous materials, is being used in the manufacture of track links, shoes, and rollers at present installed on Cat D8 and D9 tractors. The new deep-hardenable steel allows heat-treatment to harden the metal to approximately ¼ in. depth compared with a hardness depth limit in the previous steel of about ⅛ inch. This, the company states, will lead to an increase in wear-life of these parts of up to 40 per cent.

D *Bfd Ck*

Wedge press for compacting

Westinghouse Electric International Co. *New Scientist* 1959 Vol 6 (158) p 1069 (Nov 26)

Describes a new American process, for continuous compacting of metal powder in preparation for sintering, in which powder is pressed by a plunger into a three-sided trough. The method has proved satisfactory with many different metals and ceramic compositions. *D* *Bfy Cql*

How parts are made from metallic powders

H. Campbell. *Mod Mach Shop* 1959 Vol 32 (6) pp 120-127 (Nov)

The present status of powder metallurgy in industry is discussed. 12 illustr. *D* *Vwlb*

Powder metallurgy (sintered materials). La metallurgia delle poveri (i sinterizzati)

A. Butta. *Macchine* 1959 Vol 14 (11) pp 1065-1077 (Nov) (In Italian)

History, principles and process are described as well as the various uses of the produced pieces, which include bearings and cutting tools. 16 illustr.

M *Vwlb*

BP 816,417 **Stora Kopparbergs Bergslags AB** (Nov 15, 1957—conv date, Sweden)

Sintered hard alloys

A sintered mixture of aluminium oxide and the tungsten carbides W_2C and WC in eutectic ratio, which may also contain up to 10% (weight) high melting oxides other than aluminium oxide, *eg* magnesium oxide and/or quartz, can be used with great advantage as parts of cutting tools or bits, *eg* for lathe tools. (5 claims, 1 diagram). *J* *Pdc Qc.545*

USP 2,887,393 (Mar 12, 1956) **K. M. Taylor, Carborundum Co**

Refractory bodies containing boron nitride

Boron nitride, with or without a silicon carbide filler, is mixed with finely divided silicon metal and, if desired, a small amount of temporary binder or plasticizer. It is compressed and moulded, dried and fired in an atmosphere of carbon monoxide to convert the silicon metal to silicon carbide. The material may be used *eg* for abrasive articles, grinding wheels, honing stones, and polishing materials. (8 claims, no illustr). Ref cited : 7 USP ; 1 BP.

J *Pd Rf:Qc.545*

USP 2,888,355 (Jan 3, 1955) **K. M. Taylor, Carborundum Co**

Boron nitride-metal carbide bodies and the manufacture thereof

A preferred composition comprises a discontinuous phase of refractory metal carbide bonded by a continuous phase of boron nitride, usually 60% by volume. An intimately commingled finely divided raw mix of the composition is placed in a mould under a plunger and shaped under heat (1,500 to 1,800° C) and pressure (usually 400 p.s.i. or more) until the movement of the plunger is arrested when maximum density is reached. The composition is suitable *eg* for grinding wheels and other grinding and polishing applications. (8 claims). Ref cited : 1 USP ; 1 BP.

See also USP 2,789,886 and 2,808,314 (for boron nitride. *J* *Pd Rf:Qc/Pdc:Qc.545*

DAS 1,058,398 (May 29, 1954) **A. Scholz**

Method of making resin-bonded abrasive bodies. Verfahren zur Herstellung kunstharzgebundener Schleifkoerper

In order to obtain a more uniform distribution of abrasive silicon carbide grains and a uniform porosity, an intermediate product has been suggested characterized by enclosing each abrasive grain in a homogeneous hard resin layer which later is softened again by a solvent. This method is difficult to carry out. The difficulties do not arise if the intermediate product consists of silicon carbide grains wetted with a resin solvent, which might contain resin, and enveloped in solid powdered thermosetting synthetic resin mixed with very finely powdered porous anorganic matter of high thermal absorption, preferably pyrite, to saturation in the outer layer. The product is then heat treated to melt the resin, whereby layers of 10 mm thickness are subjected to infrared radiation and then allowed to cool to form resin-covered granulates of dry exterior enclosing a viscous resin core with a non-adhesive separating layer in between. This intermediate product can be stored indefinitely and is not sensitive to climatic influences. Wheels may be moulded from the product, without addition of plastifiers, or solvents under pressure at normal temperature. Hardening is effected in the usual way. The wheels have good cutting properties and a long life. (3 claims). Ref cited : 1 DBP ; 4 Swiss P ; 1 USP.

J *Ab Urb:Qc.545*

DAS 1,058,423 (Sep 19, 1959) **A. Monath, H. Monath**

Method of making a hard material. Verfahren zur Herstellung eines Hartstoffes

A mixture of aluminium oxide and carbon in very finely divided state is melted in a gaseous atmosphere containing carbon, *eg* carbon-monoxide, and then cooled, *eg* quenched. Other oxides may be present and a wide variation in the ratio of oxides to carbon is possible. A mixture of 90% aluminium oxide and 10% (weight) carbon black is suitable. The product has abrasive properties which may exceed those of the original oxides (aluminium oxide, boron carbides, silicon carbides) by up to nine times. (7 claims, 1 illustr). *J* *Rd:Qc.545*

DIAMOND TECHNOLOGY

First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.

MISCELLANEOUS

Special applications of the carbides

E. H. Sanders, R. M. Pozzo. *Carbide Engng* 1959 Vol 11 (10) pp 13-16 (Oct)

The largest potential growth of the sintered carbide industry may lie in structural applications, *ie* operations other than cutting or metal forming. More and more instances are being found where wear resistance is secondary to other physical and mechanical properties, and specific data are necessary for each grade of carbide. Properties of various carbides and certain applications are given here. 5 illustr.

D *Rg.1451.21*

Special ceramics

N. F. Astbury. *Nature, Lond* 1959 Vol 184 (4693) pp 1115-1117 (Oct 10)

An account of a symposium on special ceramics organized by the British Ceramic Research Association. A book of the proceedings is to be published.

D *Bl.541*

Metalworking lubrication

M. C. Shaw. *Mech Engng, NY* 1959 Vol 81 (10) p 62 (Oct)

25 ref. *M* *Bf Ceq Qr*

Technical surfaces in the electron microscope. Technische Oberflaechen im Elektronenmikroskop

D. Rang. *Umschau* 1959 Vol 59 (13) pp 402-403 (July 1) (In German)

Photographs of surfaces otained on glass and metals by grinding, breaking, chemical etching, and electrolytic grinding. 10 illustr, 7 ref.

A *Bf Ceq Unf Wcmm.582/Bm Ceq Unf Wcmm.582*

Surface hardening by spraying with sintered carbides. Indurimento superficiale di pezzi mediante carburi metallici spruzzati

Anon. *Macchine* 1959 Vol 14 (11) p 1080 (Nov) (In Italian)

M *B Ckz Rh*

Condensed review of some recently developed materials

Anon. *Machinery, NY* 1959 Vol 66 (3) pp 131-142 (Nov)

A list, arranged alphabetically by trade-names, of the properties and applications of several materials, including coolants, bonding processes, lapping compounds, *etc*, as well as various metals and alloys.

D *B U.514*

Evaluation of tensile, compressive, torsional, transverse, and impact tests and correlation of results for brittle cermets

M. J. Kerper, L. E. Mong, M. B. Stiefel, S. F. Holley. *J Nat Bur Stand* 1958 Vol 61 (3) pp 149-169; *Amer ceram Abstr* 1959 Vol 42 (11) p 289 (Nov)

D *Blf Unl*

How to machine zirconium alloys

A. O. Schmidt, J. R. Roubik. *Tool Engr* 1959 Vol 43 (5) pp 87-89 (Nov)

Originally developed for nuclear reactors, zirconium alloys have characteristics that should lead to many industrial applications. These alloys can be readily machined when their special characteristics are taken into account. 1 illustr, 7 ref, 1 table.

D *Bfxz Ceq U*

Vitrified grinding wheels fired at low temperature : I, Fundamental aspects of glass bonded wheels

S. Terada, Y. Ito, Y. Matsuno, H. Yamada. *Nagoya Kogyo Gijutsu Shikensho Hokoku* 1958 Vol 7 (9) pp 66-72; *Amer ceram Abstr* 1959 Vol 42 (10) p 263 (Oct) (Original in Japanese)

This study was made to obtain the preliminary data necessary for the use of glass bond in grinding wheels. White Alundum grains and $Na_2O-CaO-SiO_2$ glass powder were used. Samples fired at 800° to 1,150° C were examined by the hot load test, tensile test, and microscopic observation. The glass bonded wheels have an optimum firing range of 900° to 940° C. If the firing temperature is raised above 940°, the tensile strength of the grinding wheels decreases. This strength can be increased by annealing, *ie* reheating at 600° C for one hour and then cooling at the rate of 1° C/minute. The growth of minute crystals in the glass bond during firing gives better strength than in the case of a perfect glassy state bond. The optical properties of the minute crystals indicate them to be devitrite ($Na_2O.3CaO.6SiO_2$).

X *Pe Urf:Qc*

Some aspects of the present state of development in European machine tools. Quelques aspects de l'évolution actuelle des machines-outils européennes

J. Quichon. *Métallurgie et constr mécanique* 1959 Vol 91 (6) pp 467, 469, 471, 473, 474 (June); (7) pp 531, 533-535 (July) (In French)

The following manufacturers' machines are mentioned: Grossmann of the Hague, Holland; Georges Fischer of Schaffhouse, Switzerland; Ateliers GSP of Courbevoie, France; Otnima of Thuebingen, Germany; San Eustacchio of Brescia, Italy; Safak of Sclessin-lez-Liège in Belgium; Koepings of Koeping, Sweden; and Alfred Herbert of Coventry, England. 12 illustr.

D *Pr.132.32*

The work of factory technological laboratories

A. I. Vaks. *Machines & Tooling* 1959 Vol 30 (6) pp 7-11 (Original in Russian)

Some of the work done by factory technological laboratories is considered. Its object is to improve the techniques of manufacturing individual components and machine units, and to develop and introduce progressive machining methods. The need for greater standardization and more exchanging of experience between factories is stressed. 7 illustr.

D *Ceq.21.255.264*

Automatic control systems for machine tools

Ferranti Ltd. *Engr, Lond* 1959 Vol 208 (5405) pp 137-139 (Aug 28)

6 illustr. *A* *Pr Wp.133*

Norman-Hoffmann Bearings Corporation opens showplace of precision

Norman-Hoffman Bearings Corp, Stamford, Conn. *Mod Mach Shop* 1959 Vol 32 (5) p 182 (Oct)

A specially designed plant for manufacturing ultra-precision angular contact bearings is now operating using the latest methods and machines available to the bearings industry, it is stated. 1 illustr.

D *Az Ceq.2635*

What materials will we need in 1970 ?

Anon. *Bull Amer Soc Test Mat* 1959 (240) pp 28-29 (Sep)

3 illustr. *D* *B.132*

The ' new ' metals

M. K. McQuillan. *Metal Ind* 1959 Vol 95 (14) pp 297-299 (Nov 13)

Discusses present knowledge and research into properties of metals, including zirconium, niobium, vanadium, molybdenum, and beryllium. 4 illustr, 2 tables. (To be conl). *D* *Bf U.131*

The ' new ' metals, Part II

M. K. McQuillan. *Metal Ind* 1959 Vol 95 (15) pp 317-319 (Nov 20)

3 illustr, 2 ref. *D* *Bf*

How to do precision machining . . . in uncontrolled temperatures

H. K. Eitelman. *Amer Mach* 1959 Vol 103 (21) pp 96-98 (Oct 5)

The problem is to standardize machining and gauging when perfect temperature control is impossible. 1 illustr, 2 tables. *D* *Ceq Wbb.255*

Molybdenum

I. S. Plumtree. *Mach Shop Mag* 1959 Vol 20 (10) pp 584-586 (Oct)

Properties and uses of molybdenum are described. *D* *Bfq U/Bfq.1451*

Gems and Pearls. Edelsteine und Perlen

K. Schlossmacher. *Dtsch Uhrm Ztg* 1959 Vol 63 (10) p 520 (Oct) (In German)

Book, Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, 1959, 2nd revised edition, 340 pp, 2 colour plates, 3 tables, photomicrographs. Price DM 30.-- (In German).

See *Bibl Ind Diamond Appl* 1954 Vol 11 p 307 (Nov). Not in library of Ind Diamond Inf Bur. *A* *Bb.52*

Diamond Standards Committee Report

Diamond Standards Committee. *Guilds* 1959 Vol 14 (9) pp 2, 5 (Sep) *D* *F.2232.232.255*

German Gemmological Association annual meeting, 1959, in Hanau. Deutsche Gesellschaft fuer Edelsteinkunde, Jahresversammlung 1959 in Hanau

Anon. *Gold u Silber* 1959 Vol 12 (10) p 46 (Oct) (In German) *A* *Bb.243.322:.231*

Non-metallic bonding

Alite Div, US Stoneware Co. *Ceramic Age* 1959 Vol 74 (1) p 41 (July)

A new high temperature non-metallic bonding technique has made the production of Alite-to-sapphire seals possible. Synthetic sapphire window components are joined to Alite. 1 illustr. *A* *Bbdb Bf Cs Tz*

Norton Company expands

Anon. *Ceramic Age* 1959 Vol 74 (1) p 48 (July)

The company plans to extend its research and development department. The new research plant will contain a tripling of experimental furnacing room size and a new machine shop which will double the present one. *A* *Chc.25:.131.264*

Cheaper titanium

Norton Co. *Tooling & Prod* 1959 Vol 25 (7) p 80 (Oct)

An electrolytic process makes it easier to separate titanium from its ore and may thus reduce the cost of producing this so-called rare metal, which is in fact the fourth most plentiful structural metal in the world. *D* *Bfn Ceqm.145*

PUBLICATIONS RECEIVED

BOOK REVIEWS

Geological Survey Bulletin No 111 — The exploratory diamond drilling of the Koolyanobbing iron deposits for pyrite

H. A. Ellis. Geological Survey Western Australia. A. B. Davies, Government Printer, Perth, 1958. 141 pp, maps, tables, index.

This bulletin records in detail the results of exploratory diamond drilling of twelve holes in iron ore deposits, about 240 miles north-east of Perth, where the presence of pyritic ore was suspected. Two large bodies of iron pyrites of sufficient size and grade to constitute valuable resources of sulfur were located and the nature of the surface iron ore in depth was established. The drilling programme and results, geological considerations, core log, core recovery, sampling, assay, data and mineral determinations are described, and details are given of the diamond drilling of each hole. *D* *Bec Cfb Nh.12.38.52*

Hand controlled and automatic polishing. Vom Hand- und Automatenpolieren

W. Burkart. Eugen G. Leuze Verlag, Saulgau/Wttbg, Germany. 1959, 130 pp, illustr, indices. Price DM 7.50. (In German)

In a study of galvanotechnical problems and methods the preparatory processes of rough grinding and fine polishing must be considered, and it is to these processes that the present work, part of the ' Galvanotechnik ' series, is devoted. As the book is intended to be a practical manual for workers in this field, the text covers in detail and as simply as possible all aspects of the subject, including the nature of surfaces, introduction to different methods of grinding and polishing, and the types of polishing powders and pastes in current use, brushes, wheels and rings, various types of machine and the attachments which enable work cycles to be completed automatically. Brief chapters at the end cover the possibilities of ultrasonic cleaning, removal of dust, and work accommodation. All subjects are illustrated with very clear photographs and a comprehensive index makes the work a good one for quick reference. The emphasis throughout is on the practical application of methods rather than the theoretical physics and mechanics behind the processes. *A* *Chm Pr.52*

The behaviour of engineering metals

H. W. Gillett. John Wiley & Sons Inc, New York ; Chapman & Hall Ltd, London, 1951. 355 pp, illustr, indices.

The book is written for those who are not metallurgists but who take part in the selection of metals and alloys for engineering uses. As such it gives elementary information concerning terminology and tests in common use, general considerations as to service and behaviour of metals, and more specialized information on the different types of metals, their applications, preparation, and characteristics of behaviour. Both subject and author indices are provided and chapters are divided into sections according to subject.

A *Bc*

Diamond dressing tools

American Standard ASA B 67.1-1958. American Soc of Tool Engs, 10700 Puritan Ave, Detroit 38, Mich. 1958, 8 pp, illustr

This standard, B 67.1, is intended to establish shank dimensions of diamond tools used for dressing or truing grinding wheels. Diamond tools needing special shaped diamonds are not specifically covered but they could conform to the standard in many applications. It is assumed that the standard tools listed here can be applied equally well to off-hand wheel truing operations and to automatic wheel truing attachments for machine tools, including those fixtures which mechanically turn the diamond tool during its work cycle.

D *Ab Cg Nj.255*

TRADE LITERATURE

Better grinding at lowest cost on ceramic materials glazes, enamels, chemicals, pigments and pharmaceuticals

Diamonite Products Mfg Co, Shreve, Ohio ; English Rep : Columbian International (Gt Britain) Ltd, 116 Cannon St, London EC 4. 4 pp, 8½ × 11 in., illustr

A catalogue gives the properties and applications of Diamonite grinding rods, used for grinding ceramic materials glazes, enamels, chemicals, pigments and pharmaceuticals. Diamonite is a synthetic sapphire substance in bond, composed of crystals of aluminium oxide held together by a strong, non-metallic vitreous bond. Makers claim that it is almost as hard as diamond and that these rods provide faster grinding, longer service life, lower grinding costs, and a solution to contamination problems. Examples of performance in tests with other media are quoted. A price schedule is available. *D* *Bl Chc Pl Rjf Urf.57*

Thompson surface grinders, die grinders, and truforming machines

The Thompson Grinder Co, Springfield, Ohio. English Rep : Rockwell Machine Tool Co Ltd, Welsh Harp, Edgware Rd, London NW 2. 8 pp, 8¼ × 11¼ in., illustr

A leaflet describes features common to the whole range of Thompson surface, die, and truforming grinders, as well as giving specifications for individual models. The 'Hydra-Cool' hydraulic system, claimed to solve the heat distortion problem and ensure constant accuracy, is fully explained. Other characteristics of all machines include automatically lubricated table ways, manual cross feed for shoulder or slot grinding, and rapid, accurate positioning of the wheel to the work. *D* *Chc Pr.57*

There's money in it !

Norton Grinding Wheel Co Ltd, Welwyn Garden City, Herts. Folder, 5½ × 8¼ in., illustr

A detailed list of Norton grinding wheel specifications and a short description of a few of the more popular bonds, including resinoid, vitrified, and metal bonded diamond wheels. More than 100,000 types and sizes of grinding wheels are included in the company's range.

D *Nv.57/Pe.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1959 (3690) (Nov 4)

826,208 UNION CARBIDE CORP. Chemical process and product and abrasive articles made therefrom.

The Official Journal (Patents) 1959 (3692) (Nov 18)

826,601 TOYO KOGYO KABUSHIKI KAISHA. Grinding machines.

The Official Journal (Patents) 1959 (3693) (Nov 25)

826,729 CARBORUNDUM CO LTD. Abrasive articles.

826,678 CINCINNATI MILLING MACHINE CO. Cutter grinder.

UNITED STATES

Official Gazette 1959 Vol 747 (1-4) (Oct)

2,907,143 D. McNICOLL, BRITISH TIMKEN LTD. Means for lapping thrust ribs of tapered roller bearings.

2,907,144 D. McNICOLL, BRITISH TIMKEN LTD. Device for lapping the race members of anti-friction bearings.

2,907,145 E. W. HALL 2nd, D. R. PAONE, F. L. & J. C. CODMAN CO. Rotary abrasive element.

2,907,146 R. L. DYAR, MILWAUKEE MOTIVE MFG CO. Grinding disk.

2,907,148 V. L. SHEETS, CHICAGO WHEEL & MFG CO. Abrading wheels.

2,907,200 A. G. ROBERTS, W. A. CROUSE, R. S. PIZER, UNITED STATES OF AMERICA. Apparatus for measuring abrasion resistance.

2,907,314 J. J. OSPLACK, VINCO CORP. Grinding wheel dresser.

2,907,315 O. E. HILL, NORTON CO. Truing apparatus.

2,908,115 C. J. ENNIS, GENERAL MOTORS CORP. Honing mechanism.

2,908,117 E. W. HALL, F. L. & J. C. CODMANN CO. Rotary polishing element.

2,908,119 F. M. DUDGEON. Tool for externally truing and honing cylindrical workpieces.

2,908,553 H. FRANK, E. WILKENDORF. Process for the production of silicon carbide.

2,908,797 R. E. STEGLER, REPUBLIC AVIATION CORP. Means for and method of machining metals.

2,908,799 R. A. CRESSWELL, J. R. BRADSHAW, BRITISH OXYGEN CO LTD. Method and apparatus for electric arc erosion.

2,909,006 H. L. BLOOD. Grinding machine.

2,909,007 R. TETTKE sen, BENDIX AVIATION CORP. Treatment of inner surfaces of arcuate tubes.

2,909,009 W. D. SCHMIDT, A. F. TOWNSEND, HEALD MACHINE CO. Grinding machines.

2,909,013 M. H. HOLLENGREEN, LANDIS TOOL CO. Internal grinding fixture.

2,909,169 P. A. VONADA. Multi-purpose lapidary device.

2,909,417 W. OSENBERG. Manufacture of single or multi-stage grinding rings or the like.

2,909,640 J. B. FAIRBROTHER. Electrical discharge machining apparatus.

2,909,641 C. J. KUCYN, REPUBLIC AVIATION CORP. Tool for electro-shaping.

2,909,834 E. M. MODL, UNION CARBIDE CORP. Cermets with high impact strength.

2,909,873 J. C. FISH. Gauge support.

2,909,922 H. H. HAMAN, ANACONDA CO. Drill testing device.

2,909,945 C. F. BONHAM, FADA RADIO & ELECTRIC CO INC. Roll mechanism for tool dressing machine.

2,909,961 A. S. SAMUELS sen. Method of examining and classifying diamonds.

AUSTRALIAN

Official Journal 1959 Vol 29 (34-37) (Sep-Oct)

223,707 BIRMINGHAM SMALL ARMS CO LTD. Spark machining.

SWISS

Patentliste 1959 (18-19) (Sep-Oct)

341,146 L. SCHULTINK, P. M. VERPOORTE, NV PHILIPS' GLOEILAMPENFABRIEKEN. Method of producing pure carbides of the metals tungsten, chromium and molybdenum.

341,245 J. PFAU, ATELIERS DES CHARMILLES SA. Servo-mechanism for a machine-tool working by electro-erosion.

341,374 A. RICKENMANN, REISHAUER-WERKZEUGE AG. Device for making arcuate grinding worms for gear grinders working according to the helical generating method.

341,399 W. LADINSKY. Diamond tool.

341,400 G. SCHAERZ. Method of manufacturing a bearing member of a synthetic stone.

341,429 G. LEFEVRE, SOC "MO.NA.COR". Machine for holing, in particular hard metals, industrial stones, drawing dies and horological stones.

341,585 R. HABIB, HAWERK AG. Device for eroding a metallic workpiece by electricity.

341,674 J. SIGAAR. Precious stone.

341,697 ATELIER DE MECHANIQUE DE PRECISION M. ET L. ESKENAZI. Tool holder for a cutting bit.

341,729 S. A. BOETTCHER, CRANE PACKING CO. Lapping machine.

341,773 R. C. BRAITHWAITE, F. N. M. SERGEANT, S. SMITH & SONS (ENGLAND) LTD CRICKLEWOOD WORKS. Chronometric device.

FRENCH

Bulletin Officiel 1959 Vol 76 (3935-37) (Oct)

1,206,732 H. M. HOBSON LTD. Method of grinding and grinding machine for carrying out the method.

1,206,740 D. W. DANIEL, NATIONAL BROACH AND MACHINE CO. Method and device for the finishing of gears.

1,206,780 W. SCHNEEBERGER AG. Polishing machine for spherical glasses.

1,206,959 G. BOTTE, F. BOTTE. Machine for profiling the rectangular rims of glasses by means of a cylindrical grinding wheel.

1,207,683 ZAHNRADFABRIK FRIEDRICHSCHAFEN AG. Device for truing profiled grinding wheels for the grinding of pinions with helicoidal involute gear teeth.

1,207,689 AGIE AG FUER INDUSTRIELLE ELEKTRONIK. Electrode holder head for machine tools working by electro erosion and its control.

1,207,750 H. E. W. A. HAGGERTY, E. L. RITTER, CINCINNATI MILLING MACHINE CO. Method and machine for machining and grinding drills.

1,207,780 K. HACK. Device for the automatic truing of grinding wheels for machines for grinding the ends of springs.

1,207,946 A. C. GSTALDER. Measuring device for the cutting force of machine tools with one or two components.

1,207,960 G. BERSOT. Method and machine for the working of stones and the like.

1,203,263 W. OSENBERG, BISTERFELD & STOLTING, Face grinding wheel.

1,208,343 ATELIERS DES CHARMILLES SA. Servo-mechanism for controlling the displacement of an electrode in a machine working by electro-erosion.

GERMAN

Patentblatt 1959 Vol 79 (43-46) (Oct-Nov)

Applications Open to Public Inspection

1,068,024 K. REUSCHEL, R. E. PRETZFELD, SIEMENS-SCHUCKERTWERKE AG. Method and device for producing a solid body of crystalline material, in particular a semi-conductor body.

1,068,087 W. FERD, KLINGELNBERG SOEHNE, H. SCHICHT. Method and machine for lapping gear wheels.

1,068,144 H. BECKER. Device for circular grinding of roller journals, punches and similar bodies of revolution.

1,068,528 G. TAUBE, MAHLE KOMM-GES. Journal bearing for the tool spindles of precision machine tools.

1,068,578 L. O. CARLSON, E. D. DAMMERT, GLEASON WORKS. Grinding machine for grinding tools, in particular gear milling cutters.

1,068,579 R. LEHMANN. Device for re-grinding the cutting blades on the cutter bar of paper cutting machines.

1,068,600 A. RITCHER, B. SCHUBERT, HANNI-WERKE KOERBER & CO KG. Automatically adjustable grinding device for the knives of a tobacco cutter.

1,068,682 P. TARDIEU, R. PERIERES, PECHINEY COMP DE PRODUITS CHIMIQUES ET (1,068,682) ELECTROMETALLURGIQUES. Obtaining aluminium oxide from bauxite with a high content of silicic acid.

1,068,974 H. LINCKMANN, TH CALOW & CO. Cutting body, preferably of hard metal.

1,069,026 R. HOLER. Method for making grinding tools.

1,069,072 W. GRISEL & CO. Device for successively feeding watch stones or the like uniformly oriented into a channel.

1,069,308 H. SCHIERHOLT, DEUTSCHE EDELSTAHLWERKE AG, AEG. Device for controlling the feed of the electrode in spark erosion machines.

1,069,309 H. SCHIERHOLT, DEUTSCHE EDELSTAHLWERKE AG, AEG. Circuit for controlling the electrode feed in spark erosion machines according to the spark current.

1,069,350 N. H. KLAGES, AMERICAN WINDOW GLASS CO. Device for cutting transversely a continuously vertically rising ribbon of glass.

1,069,392 M. E. ABBOT, L. H. LAAKSO. Testing of surface profiles.

1,069,488 G. MEINDL. Internal grinding spindle.

Patent Granted

972,986 F. KLAASE, DIDIER-WERKE AG. Method for making silicon carbide stones.

ABSTRACT NOTIONS

Trade literature for you . . .

Trade literature reviewed in *Industrial Diamond Abstracts* is *not* available on loan. Readers wishing to obtain copies should contact the manufacturer whose address is shown at the beginning of the review.

. . . and for us

In order that readers may be kept informed of developments in the industrial diamond and allied industries, manufacturers are requested to send review copies of their trade literature to: Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1.

Loan Service requests

The Loan Service operated by the Information Bureau is very widely used by firms and individuals in the United Kingdom, so much so that it is not unusual for several requests to be received for the same article. If users of the Loan Service will ensure that borrowed periodicals are returned within the specified 15 days, it will reduce the delay for those on the waiting list.

A short cut . . .

Our librarian receives many requests from America for the originals of articles that have appeared in the American trade papers. A delay is thus caused as the librarian has to contact the American journal concerned in order to pass on the request. Two trips across the Atlantic could be avoided if American readers would apply direct to the journal in which they are interested.

Addresses

Readers are reminded that it is in their interest to keep the Information Bureau informed of any changes of address.

IDR REPRINT SERVICE

A limited number of reprints of the following article is now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1 :

Spiral and other growth forms of synthetic diamonds : a distinction between natural and synthetic diamond, by S. Tolansky and I. Sunagawa (*Nature, Lond* 1959).

HIGHER OUTPUT THAN EVER!

HABIT Cutglas

DIAMOND EDGEWORKING MACHINE

Robustly and rigidly constructed, this machine has been specially designed to carry up to three $\frac{3}{8}$" wide pencil edging wheels. Fitted with detachable truing device with fine screw feed to give controlled dressing of diamond wheels. A 'must' in every modern glassworks.

Features include—

Quick and easy access to wheels and coolant pipes.

Detachable wheel dressing attachment.

Removable coolant tank for easy cleaning.

Model H.C.6. for 6" wheels H.C.10. for 10" wheels.

Fully illustrated literature on request.

EDGE GRINDING OF DISCS AND CIRCLES

Special attachment enables discs and circles from 2" to 6" diameter to be pencil edged quickly and accurately even by semi-skilled operators.

MAKE IT A **'HABIT'** *TO BE ACCURATE*

HABIT DIAMOND TOOLING LIMITED

LURGAN AVENUE, LONDON, W.6 TELEPHONE FULHAM 7944

Telegrams HABIT, LONDON, W.6

a journal for precision engineers and all users of industrial diamonds and other hard materials

INDUSTRIAL DIAMOND REVIEW

incorporating INDUSTRIAL DIAMOND ABSTRACTS

MONTHLY 1/3 SUBSCRIPTION 15/- A YEAR

January, 1960 Vol. 20 No. 230

a DEMONSTRATION?

IF YOU CUT, drill or grind glass, ceramics, carbide or any known hard material the Neven Mobile Unit will demonstrate most efficient production methods with diamond tools. May we send this Demonstration Unit to your works? The Sales Manager would be pleased to advise you when the Unit will be in your area.

IMPREGNATED DIAMOND PRODUCTS LTD OF GLOUCESTER

JW2 TELEPHONE 21164 (3 LINES) · TELEGRAMS IMPREG GLOUCESTER

IDP